COAL AGE

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ONE of the greatest hindrances to success in mine management is the lack of close observation on the part of officials. The original man is to be admired, and initiative should be commended, but the fellow worth while is the one who can supplement such virtues with an ability to cull the best ideas from everyone with whom he comes in contact.

And by observation, we don't mean simply a casual glance that only records the fact and fails to analyze the cause. Thousands of people had seen the cover of a tea-kettle forced up by steam, without pondering the occurrence, but to Watt the phenomenon meant something, and he was soon busy applying his ideas to perfecting the steam engine.

Perhaps a million people, before Archimedes, had observed water run over the side of a vessel when another substance was immersed in it, but no one had sufficient curiosity or ability to examine the matter in detail and give the world the laws of specific gravity.

A close observer can learn from the mistakes of the uninformed as well as from the correctness of the wise. We don't always have to visit the most modern plants to secure ideas that will help us at home. Frequently, much benefit will be derived from watching some other fellow give a demonstration of "how not to mine coal."

Success of one kind or another is what we are all striving for, and no one element is so indispensable to a prosperous outcome as attention to details. Truly! great deeds excel great thoughts, and all of us like to plan big things, but we lose enthusiasm when confronted with the drudgery of cleaning up the minor particulars. The manager of a coal mine may be brilliant, but if among his defects is included an incapacity for the small essentials, then in truth he is like the dancing master who had every qualification except that he was lame.

Recently, in COAL AGE, one of our most famous geologists called attention to the vital necessity of making a careful examination of coal measures before concluding final plans and starting development work. And few of us but know of the sorry mess some men have made in the location of a shaft or drift, when a careful analysis of the original situation would have saved the operating company thousands of dollars in pumping or haulage.

You say you are observing! Well, stop one minute and ask yourself how many steps lead up to the door of your house, or how many letters there are in your name. You've climbed your steps every day for a year, and written your name thousands of times, still your observation was entirely general. Hasn't it been just as superficial when you walked about your plant and through your mine?

Of course, you know the number of men you employ and their daily output of coal; the quantity of water to be pumped and the volume of air required—chief items that affect daily expense. But how about the lesser details—waste of timber, iron, nails, oil and other supplies; cost of steam, charges against mine-car repairs, loss of electric power through poor rail-bonding and defective insulation, resistance of cars to traction—these are a few of the leaks that drain the exchequer.

Successful men have been remarkable because of their minute attention to small things. Like the elephant, they can move colossal masses or pick up a pin. The difference of intellect in men results more from a cultivation of the habit of attention, than from any great disparity between the mental powers of one individual and another.

Furthermore, our interest in things about us always increases in direct ratio with our knowledge of them, and our knowledge results largely from close observation. No man is less brilliant in the great things of life because he pays attention to the lesser essentials. Details are the mortar which binds the great walls of our daily operations.

Determinants of Coal Thickness

By R. Dawson Hall

Structural rolls in strata may be coeval foldings. If so, they will modify thickness; if noncoeval, the coal will pass over the anticlines and synclines without change. The thickness of a peat bog under pressure decreases as the cube of its linear dimensions. Some increases in thickness are due indirectly to erosion.

As the coal thickness depends in some degree on the structure of the measures of which it forms a part, a few preliminary words on that structure may not come amiss.

The structural rolls in strata may have been existent or developing when the strata were laid down; such rolls we term "coeval." Many were developed from stresses more recently imposed on the measures; for instance, the Appalachian coalfields were slightly rolled during the time the coal was being deposited, but later a severer stressing took place, known as the "Great Uplift." The first flexures we know as "coeval" rolls and the latter as "non-coeval." The Pittsburgh bed shows the former rolls not nearly so plainly as the beds of the Allegheny series. Probability favors the idea that it was laid down during a period of profound rest, when the motion of the measures was slow and of like sign, up or down, over large areas.

Not so was the condition during the deposition of those beds we class together under the caption "Allegheny," nor even in the time immediately following the laying down of the Pittsburgh Bed, when the pre-Sewickley rock and the Sewickley coal bed were deposited. Frequent rolls and constant variations of thickness mark the Allegheny or Lower Productive coal series. The variations of thickness will make a bed like the upper Kittanning run from 14 ft. to 2 ft. in a furlong of horizontal distance.

The lower Kittanning and the Freeports give reassuring thickness in the coeval depths followed by thinnings on coeval hilltops. It is the lack of recognition that all dips and hills are not coeval (that is existent when the coal was deposited) which has caused many people to formulate the untenable theory that coal thickens in all dips and thins on all domes and ridges and to be disappointed in the showing made by coal beds in dips where the folding occurred after the coal was lignitic or even of harder structure.

The Dips of the Allegheny Series.

The directions of the folds of the Great Uplift vary from 10 to 45 deg. east of true north, whereas the folds of the Kittannings in the Lower Productive series are almost due east. There is no mistaking the existence of the latter for, where the measures are flat, they can be traced in the lower and upper Kittanning beds for miles. The basins are 30 ft. deep and over, in many places, and have side-slopes with 6 to 10 per cent. grades. The coal thins as soon as the rises are encountered. A field of coal, which ran almost uniformly 30 in. in thickness, showed 4 ft. in a long dip running across it. The basin occurred in the lower Kittanning bed and was very regular, both in line and thickness of deposition except where such dips occurred.

I am well acquainted with the bed just mentioned and it is invariably crossed by these little synclines, which, strange to say, often affect the cleat of the coal as much as 15 degrees. These dips do not

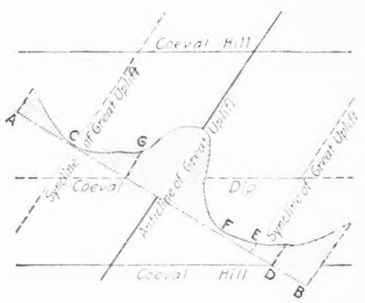


Fig. 1. Crossing of Structural Folds

appear to reproduce themselves infallibly in the Freeport measures above. The dips in those beds seem to be less continuous, and rather of the bowl-shaped order. The shrinkage of the Kittanning peat beds must have been very complete before the Freeports were laid down or the dips in the former would be immediately overlaid by those in the upper bed and would be coterminous with them, which does not appear to be the case.

The whole subject needs careful study where both beds are being worked, but unfortunately, in the region where both are operated, contouring of the coal floor and the use of superposed maps is not usual, the interval being great enough and sufficiently strong to make columnization of the pillars unnecessary, with the result that correlative mapping is not appreciated. Moreover, the beds are thin and caving is rarely complete.

Coeval Dips are Often Disguised

In view of the shrinkage of the lower beds and their failure on the whole to influence the surface on which the Freeports were laid down, we must expect to find the interval increased where the coal thickness in the lower bed is greater, if meantime other foldings do not occur to modify conditions.

It must be remembered that, when in crossfolding a minor dip is elevated to the flank of a larger fold, that minor dip may cease altogether to be a dip, as shown in the Fig. 1 at *G*, and become merely a decreased rise, but its original existence as a dip may not be gainsaid. Moreover, the effect of the coeval hill crossing the cross section at *D* is to move the apparent location of the syncline of Great Uplift at *E* to a point *F* nearer the flank of the anticline.

It is, of course, true that the Federal maps show structural contours which are, in a measure, really the composite result of all flexure and not merely of the Great Uplift, but in central and southwestern Pennsylvania, at least, the lines mainly exhibit that great convulsion and not the smaller crossing curvatures. Farther west the charted synclines are more contorted as they combine in one, the past with the remote past. There the flexures are more equal. It seems a pity that an attempt is not made to record these coeval flexures, tracing their progress from quadrangle to quadrangle. Structurally not so evident, economically they have even a larger value. And it might be not amiss here to suggest names for such coeval synclines and anticlines whether they be coeval with coal or coeval with other sediments. Such synclines might be termed "vallines," and such anticlines "collines."

The Law of Shrinkage.

The only basins which effectually modify the thickness of a coal bed are those basins the formation of which is coeval, or approximately coeval with the deposition of the seam. Where coeval, the peat probably filled the basin so that it was level with that on the undepressed portions or on the anticlines. But the peat has shrunk considerably. Still the peat residue covers the original area but its thickness has been reduced in proportion to the cube of the lateral reduction. If a cubic yard has shrunk to one-third of its former linear dimensions, the thickness of a cubic yard has become 1/27 of its former thickness for the lateral spread has in no way changed, this spread being maintained constant as a result of superincumbent pressure and friction.

Fig. 2 labors to make this fact more obvious. The cube on the left represents a cubic yard and that on the right the same cube shrunk in three directions to one-third of its former linear dimensions.

The little strip marked off on the large cube at its base shows to what diminutive proportions vertically that cube will be reduced when the vertical dimension is shrunken to such a point that the volume of the strip is equal to the volume of the cube to the right. The depth of that strip will be but 1/27 of the full height of the original cube.

This fact makes it hard to account for variations of thickness such as the middle and upper Kittanning beds exhibit, in valleys unequal to such depths of deposition as would account for such variations. Many theories might occur, either that the bogs slid into place from a distance after they had already been subject to a large amount of shrinkage, or that the time of deposition was so long that the lower layers were well contracted before the upper were deposited and that was doubtless true in almost every case, or that the deeper portions of the bog shrinking more than others, drew away portions of the shallower. We may dismiss as wild the suggestions that these peats shrank less than others because they are often of cannel and, therefore, have a pore-like structure and the amount of ash is not excessive. It appears probable that the first surmise is correct as the beds are by no means reliable consisting often partly of cannel and partly of ordinary bituminous coal.

Nevertheless, the shrinkage of the bog during deposition and the consequent fluid movement, must often have modified its depth where the floor on which it lay was uneven.

Possible Decrease of Thickness in Dips

Rolls in the strata, occurring later, folded them, but did not change their thickness, but if a heavy deposit of silted material should fill up the depressions of these rolls, then there would be more pressure in the dips, and any plasticity in the peaty coal would cause it to flow away from these synclines toward the anticlines adjacent.

The action would not be marked, because of the little plasticity remaining in the coal, its naturally fibrous condition, the friction of its contacts, and the fact that the motion is against the operation of gravity.

It is for this reason that we look for thick coal, not where the charted synclines appear on the Federal maps, for these large synclines are to be dated thousands of years later than the coal depositions, but to those uncharted synclines of even date with coal depositions, concurrently created with the growth of the coal forest.

To use the Georges Creek field as an illustration: The coal in the bottom of the basin at Consolidation No. 10, the former main pumping shaft, is not thicker than the coal which lines the slope of the syncline. But as we go southward up the southern end of the canoe-shaped fold, the coal gets thicker, and all the intervals grow larger, because the southern end of the field suffered a depression during the coal era, which was more than negatived in places by contrary and cris-cross flexure later. But the original folding, while scantily modifying the final lie of the Pittsburg coal, made a modification of 4 to 6 ft. in its thickness. This action is not peculiar to Georges Creek; in countless places it is exhibited in larger or smaller degree over the whole earth's crust, carboniferous or non-carboniferous.

Coal Thickness in Anthracite Region

This consideration is not addressed to those engaged in anthracite development. Having seen plications of great magni-

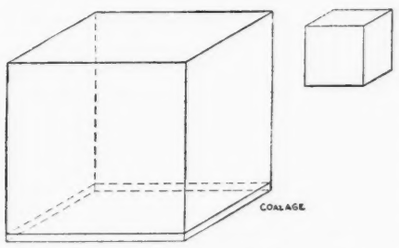


Fig. 2. Diagram Illustrating Restrained Shrinkage

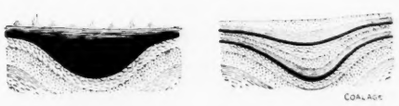


Fig. 3. Showing Peat During Formation, and After Shrinkage

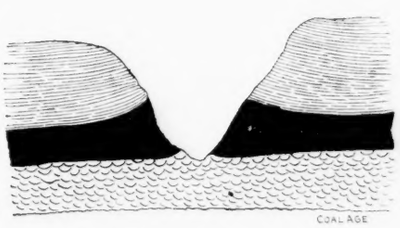


Fig. 4. Coal Beds Thickening toward Stream

tude and coal, thickening and thinning without regard to them, the hard-coal geologist would entertain no such fallacy as appeals to the operator of the Allegheny series of bituminous coal-beds, to wit that "where there is a dip, there thick coal will be found." It will be recalled that it was in a bituminous field, in Elk county, that Leslie and Ashburner, of the second Geological Survey, found it necessary to declare that the anticline coal was as thick as that of the syncline.

The coeval and near-coeval dips probably exist in the anthracite region, but are only faintly to be discerned where such violent upheavals have occurred. In fact, an anthracite expert would be prone to say dips do not control thickness because the larger foldings, the only foldings which the present conditions permit him to identify, are not marked by a change in bed-content.

Hence we do not seek for thick coal in the more recent and major plications, but in those which date their rise to the period either prior to the deposition of the coal, or contemporaneous therewith.

Erosion and Coal Thickness.

And again there was another cause of coal thickening, not inoperative to-day, when the seams are but little subject to plastic flow, but very much more operative when the peat bog yielded freely to every inequality of pressure. To-day we often find that where recent erosion has relieved large areas from pressure, where valleys 400 or 500 ft. deep have been carved in ancient measures, there has been a flow of all plastic bodies, bituminous coal, clay, and soft shale toward the outcrop. There these beds are thickened, though often partly washed thin again, where the very edge of the measure is reached. Far more, where erosion has developed soon after the deposition of carboniferous strata, the plastic measures have moved in part toward the unstressed or less stressed areas, to pile up along the outer lines of the eroded districts. The sandstones and slate were then more feeble to resist the powerful stresses of such fluxions and lipped up freely near the edges.

And thus we find an eroded area, a fault, we term it, of erosion, lined out significantly with areas of thicker coal and clay, surmounted by weakened slate and sandstone.

Where erosion has been extensive, the peat bog may be lifted and deposited during floods at some distant point, or even over the same seam, making a very thick bed with or without a binder. When redeposition takes place, the speed with which the fibrous mass is thrown forward may cause the resulting coal to lie at a sharp angle, the rapidity of its motion thrusting the upper end far up above the level of the water conveying it.

All portable mine pumps should be used with motors which can be thrown directly on the line without the use of a starting device, and without taking an excessive current. In case the power fails temporarily, such motors start themselves when it returns. All switches for use with such motors should be properly fused.

Needless Waste of Grease and Oil

By E. L. Cole

Grease and oil can be saved if a scientific examination is made of the needs of each part lubricated, and if a proper sense of responsibility is created among oilers. A series of forms publicly posted will call general attention to the efficiency of each man's use of the oil entrusted to him.

The general manager of a large coal mining company paused as he was about to affix his signature of approval to the ever increasing oil bill of his corporation, and as he looked over the bills for the previous ten months he came to the conclusion that here was a financial leak that could possibly be stopped. He detailed a young clerk in his employ to ascertain if possible, how the worrisome oil bill could be reduced without detriment to the well being of the machinery. Early on Monday morning he started on his tour of inspection to various collieries, his first stop being made at a fan engine-house: Taking out his stop watch, he carefully counted that in one minute 110 drops of cylinder oil entered the chest of the 12x12 cylinder of an engine running at 110 r.p.m. Scattered about in various parts of the house, were divers vessels containing cylinder and engine oil, while on the door step was a powder-keg overflowing with a heavy strap oil for use in the journals of the fan shaft.

Waste in Use

The number of drops fed through the lubricator was reduced to 35 per min., and by careful experiments the exact amount required per day was ascertained. The oil for the engine bearings, which had hitherto been fed in a haphazard manner was subjected to similar methods to determine the proper amount needed to oil the bearings adequately, and two oil cans of standard size were placed in the engine room, so that in the future no excuse could be offered for placing oil in open vessels into which particles of dirt would readily fall, seriously impairing its lubricating value. Many gallons had hitherto been wasted in such slovenly methods as were in use. Experiments proved that the large shaft bearings could be lubricated by a low quality of polar grease more economically than by oil, so the use of oil was discontinued. This was ascertained by making careful experiments, which occupied three days, during which time temperature tests of all bearings were taken, with a mechanical engineer's thermometer. In a like manner the proper amount of oil for a safe operation of the entire fan equipment was precisely determined.

A blank similar to Form 1, was made out in triplicate and upon this the clerk in the oil house would enter the amount issued to the fan engineers during the month, and in case the amount was more than the printed figures, a demerit mark was entered, of which I shall have more to say further on.

One of the filled forms was kept at the oil house, one filed at the office for the foreman's and superintendent's use, and one given to the engineer. By this method, all concerned were kept posted and lapses to the careless methods of former days were easily prevented.

M. & M. COAL CO. X. COLLIERY — Aug. 1911

Fan House	Amount Allowed	Amount Used
Cylinder Oil	3 Gal.	3 Gal.
Engine Oil	10 Gal.	8 Gal.
Polar Grease	5 lb.	4 lb.
% Merit for Balance on Hand	102 %	
% Demerit for Over Drawn %		

Oil Clerk..... Engineer.....
Foreman.....

COAL AGE

Form 1

M. & M. COAL CO. X. COLLIERY — Aug. 1911

Electric Locomotive	Amount Allowed	Amount Used
Engine Oil	5 Gal	4½ Gal.
Gear Lubricant	1 Pint	1 Pint
% Merit for Balance on Hand	101 %	
% Demerit for Over Drawn %		

Oil Clerk..... Engineer.....
Foreman.....

COAL AGE

Form 2

M. & M. COAL CO. X. COLLIERY — Aug. 1911

Power Plant	Amount Allowed	Amount Used
Engine Oil	10 Gal.	10 Gal.
Cylinder Oil	4 Gal.	4 Gal.
Polar Grease	1 lb.	¾ lb.
% Merit for Balance on Hand	102 %	
% Demerit for Over Drawn %		

Oil Clerk..... Engineer.....
Foreman.....

COAL AGE

Form 3

Waste by Mixing with Impurities

The next visit was to the motor barn, wherein six 8-ton electric locomotives were housed at night. Right at the entrance was a powder keg filled with sand; and in close proximity, as though keeping company with it, was a battered powder keg containing a high grade of lubricating grease with a fair amount of sand lying on its surface. This had evidently fallen into it while some careless employee was filling the sandbox of the locomotive previous to making the initial morning trip. Investigation disclosed the fact that much expensive lubricating grease was rendered valueless by just such careless methods.

The inspector found that the armature and axle bearing were lubricated with this kind of grease, and it really seemed as if workmen whose duty it was to attend to the bearings, thought that the grease had remarkable penetrating qualities, as he did not stop when he had filled the bearing boxes to the utmost capacity but continued to apply the lubricant, the exterior of the bearings being covered with a liberal amount of the grease. But even with this he did not rest content for he had a habit of making a hole through the center of the boxes and pouring a high-grade of engine oil into the armature bearings, which would promptly run through the lodge in the lower half of the motors to the detriment of the insulation of the field coils.

The practice of filling sand boxes in the locomotive houses was strictly prohibited, so that valuable lubricants would no longer be rendered useless by the addition of sand, and the net saving obtained by correct methods of lubricating the locomotives was really amazing, as all expenditure for high-grade grease was saved. Careful experiments proved that lambs' wool used in all bearings, end journals included, was far superior to any other form of lubricant, when saturated with a small amount of engine oil. The use of a lubricant purchased on the open market for the quieting of pinion and gear wheels was found to be far more efficient and more economical than polar grease. The motor hostlers were also furnished with a blank similar to that marked Form 2. This was distributed in the same manner as the first form.

Waste of Oil by Excess Feed

The next leak the inspector discovered was in the power plant, where there were in operation four 250 kw. engines operating at a speed of 220 r.p.m. One of the engines was equipped with ordinary sight feed, hand-filled oil cups; one of the others, with an automatic oil-cup system, through which the oil was forced by a small rotary pump, which was attached to the engine; the remaining two had the inclosed splash type self-oiling systems. The engineer furnished the surprising information that the engine equipped with the hand-filled oil cups, consumed the least amount of oil, although the other engines had been purchased, partly because of the saving in oil that the manufacturers insisted would be

effected in the operation of their engines. Further investigations developed the fact that the reason why the hand-filled oil cups consumed less oil, was that the engineers had regulated the handfeed so that their periods of rest would recur at regular intervals, while the oil in the inclosed type of engine was changed when the whim of the engineer dictated without regard to the condition of the oil, which nevertheless was promptly thrown into the sewer as being unfit for further use.

Reclaiming Waste Oil

A new method of changing oil was inaugurated, determined by the number of hours the engines had operated, and the

M. & M. COAL CO. X. COLLIERY — Aug. 1911

Car Oiling Report	Amount Allowed	Amount Used
Total No. Car Wheels Oiled 400	20 Gal.	20 Gal.
% Merit for Balance on Hand	100 %	
% Demerit for Over Drawn %		

Oil Clerk..... Oiler.....

Foreman.....

COAL AGE

Form 4

M. & M. COAL CO. X. COLLIERY — Aug. 1911

Merit Report of Oil Used		% Merit	% Demerit
John Thomas	Car Oiler	101	
Wm Brown	Power House	105	
Joe Kellar	Breaker Engineer	103	
Wm Brecker	Fan Man	102	
John Ambrose	Breaker Machinist	100	
Harry James	Motor Man		1

Note: The Printed Figures on all Oil Users Forms indicate the amount that careful Experiments furnish as entirely adequate to Lubricate Machinery and constitutes the amount Users are intitled to every Month

Those who use less are given a % of one in the merit column for each Dollars worth that they save, and those who overdraw their account will receive a demerit mark of 1% for each Dollars worth of Lubricant that they overdraw

Form 6

COAL AGE

Form 5

dirty oil was placed in 5 gal. tanks equipped with sight-feed glasses and small taps, placed about 1 in. from the bottom. In about 10 or 12 days the impurities in the oil would settle to the bottom, leaving it clear. Then it was drawn off and delivered to other places as I shall show later. Fig. 3 is the form that was issued for the use of the power-house engineer.

On the way over to the breaker the inspector's shoes stuck in a mass of oil and dirt. A careless employee, whose duty it was to oil the mine-car wheels, had more concern, as a moment's observation disclosed, in oiling the exterior of the car wheels than their axles. The oil would promptly run off and soak into the ground with the result that much oil which had been purchased for lubrication merely saturated a path along the car tracks.

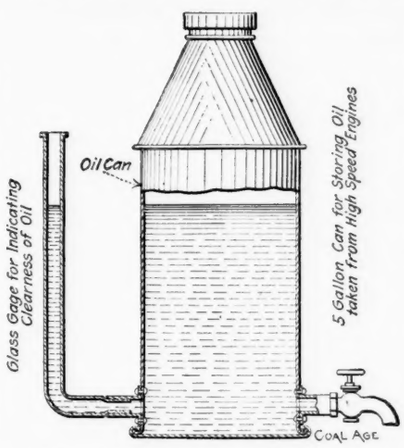
This employee was promptly furnished with a form to fill out and further waste was effectively prevented. As he was also furnished with a stencil to mark the date of oiling, his foreman could readily see whether all cars were oiled in due proportion to their needs.

Using Oil a Second Time

In the breaker were found the most lax methods of oiling and safeguarding bearings. A large number of the oil boxes contained no waste whatever, and the oiler would pour in oil, only to see it promptly run out at the bottom. As there were over 200 bearings the waste was really enormous, so a blank similar to the other was ruled and efforts made to prevent future loss. The oil saved in the power plant was now delivered to the breaker, as it was found to be equal in quality to the grade there used. Thus another item was deducted from the oil bill.

Waste of Oil in Hot and Cold Weather

At the close of the tour the inspector paid a visit to the oil house. Here he found several barrels of oil upon the



Cleansing Tank for Waste Oil

racks, where it was served to the employees, who had been in the habit of bringing all sizes of oil cans and demanding whatever amount of oil they thought necessary for their needs, and he found that a month's supply of oil was shipped from the general storehouse on the first of every month. Through the lack of room, some of the barrels remained outside until required, with the result that in the summer months, much oil was lost by evaporation. In fact, in the month of August, one entire barrel of gasoline was lost in that manner, while in the winter, much of the heavy oil was lost owing to its adhering to the interior of the barrel.

A large saving was effected by installing metal tanks, which were amply large for an entire month's supply. They were equipped with automatic measures, so that only the exact amount of oil required, would be drawn and delivered directly into the oil cans, and all guesswork was thus forever eliminated.

The Merit System

A merit system for the recognition of those men who were really interested in saving money for their employers was instituted. Form 5 was made up at the office and posted at a conspicuous place, so that all could see the standing of the various engineers, and a friendly talk was delivered to all users of oil, the speaker emphasizing the money value of the wasted oil and asking each workman to use lubricants in the same careful way in which he would use any commodity which he had to purchase out of his own pocket.

After the new system of distributing and using oil had been in operation long enough to prove its effectiveness, the bill was found to have been reduced 37½%.

Coke Notes

The coke from the lower Connellsville field is smaller than that made from the Connellsville coal in the old region, and up to about a year ago it was thought that large, bulky coke could not be made from lower Connellsville coal without pulverizing or washing. A test was recently made at one of the older plants in the old region in small ovens with coal from a lower Connellsville mine, and the coke made was of good structure, equal to the old-region coke. Whether this reversal of form was due to the small 11-ft. oven or to the peculiar character of the coal from that particular mine, is not known, but the fact remains that at the old plant large coke was made with the lower Connellsville coal.

The Mitchell oven is a modification of the Belgian type, one difference being that it provides an improved combustion chamber. The process is identical with that of the beehive oven. In this type, there is an opening at both ends; consequently, the oven can be discharged in a few minutes by a pusher extending through the oven, thus utilizing practically all the heat for the next charge. The oven is immediately charged after pushing. The dimensions are approximately as follows: Height at the center, 7 ft. 6 in.; height at end, about 4 ft.; width at pusher end, 4 ft. 10 in.; width at discharge end, 5 ft., and length, 32 feet.

While giving testimony before the Senate Committee on Interstate Commerce, Judge E. H. Gary is credited with the following remark on Illinois coke:

If some concern like the United States Steel Corporation, which could afford to expend the necessary sums of money to make these experiments and tests had not been in existence, the country would not know today that coal mined in southern Illinois can be used for coking purposes. The steel corporation is now using 25 per cent. of southern Illinois coal in its furnaces and later on we will increase the amount to 50 per cent. As a result of our experiments with this coal we have purchased thousands of acres of it in Illinois at $30, which if located in the Connellsville, Penn., field would sell for $1000 per acre.

The Problem of Mine Timbering

By R. B. Woodworth*

With the growing necessity for intensive mining and the depletion of our forests, the problem of mine timbering has come prominently forward as a most important factor in the cost of coal. Four methods of dealing with the problem are discussed in this article which is the first of a series on mine timbering having special relation to the use of steel.

*Engineer with the Carnegie Steel Co., Pittsburg, Penn.

Note—Paper read before the Kentucky Mining Institute, Lexington, Ky., Dec. 11, 1911.

Success in the conduct of mining operations is only attained when the product of the mines is marketed at such rates over and above the cost of production as will insure a fair return on the capital invested. Other considerations may be brought prominently into view during periods of exploitation or at times of depression, but in the regular run of affairs, the men who operate mines do so in order to reap the rewards of their labor. To reach this desired end in the highest measure it is required that the capital invested be as small as the fundamental principles of true economy will permit, that the cost of production be as low as intelligent skill can make it, and that the rates at which the product is sold be as high as the most efficient sales organization can secure. Under modern conditions of competition this high success in the conduct of mining operations is gained by that careful attention to details which is known as scientific management.

Where the Operator Must Look for His Profit

Time was, when many features of mining could be left to unskilled workmen; today in order to insure the largest possible return on capital investment, every problem which has to do with the employment of men and expenditure of money demands serious consideration and requires solution, not by rule of thumb methods, but by the application of the rules of economic science. The timbering of the mines is one of these problems, and it is to the credit of many mine owners and operators that they have appreciated its importance and applied their intelligence to its solution.

The price paid by the consumer per unit of product is in a measure fixed by economic law and is, therefore, in a way beyond the control of the mine owner or operator. He may decide against selling in any particular market; but once he decides to sell, the price is fixed for him by the conditions of competition in that market. So far as the operator is concerned the price that he receives may be regarded as made up of four items: cost of production in the mine, cost of preparation at the mine, cost of transportation from the mine and profit or loss. The third of these items he does not control, and the magnitude of the fourth is, therefore, dependent upon the measure of success with which he deals with the first two. The smaller he can make these, the larger will be the fourth.

It is not intended, in this article, to deal with the cost of preparation, but it is purposed to point out that the cost of production in the mines is under the control of the operator and that it behooves him to pay careful attention to all the elements which enter into it. These elements are: (1) Cost of labor and tools. (2) Cost of explosives. (3) Cost of transportation and hoisting. (4) Cost of mine timbering. (5) Cost of superintendence and administration. While the cost of labor per man has increased in recent years and may continue to do so, scientific management reduces the cost per ton by the introduction of machine methods of mining. Such management also reduces the cost of explosives by the selection of the most economical forms and the regulation of their use and also by the substitution of hydraulic blasting. The cost of transportation is reduced through the displacement of mules by locomotives, wooden cars by steel cars, and poor roadways by good ones. The cost of superintendence is lowered by the employment of trained men having skill and intelligence rather than brawn, and the cost of mine timbering is reduced by that intelligent and discriminating use of the materials of construction which lies back of the structural phase of our industrial development.

Importance of the Mine Timber Problem

Once the subject of mine timbering was no problem. The mine foreman sent his timbermen into the adjoining forest to cut down what few props were needed for use at the mine entrance and in the rooms and headings and recked not what particular size of timber he used or whether, in using for mining purposes the best timber which grew on the land, he was not at the same time committing an economic crime. The mine owner who now looks back over the records of the past will note that the best timber has long since disappeared, that any kind of timber suitable for mine-timbering purposes is in some localities hard to get, and that year by year the cost per ton for the maintenance of the timbering in shafts and headings has steadily grown. True, this growth is not entirely due to the depletion of the forests but in part also to the deeper character of the workings, the larger sizes of timber required in such deeper workings and the increased lengths of headings that it is necessary to maintain.

Wood in the Mines

Wood has played a most important part in the timbering of mine excavations. In 1905, according to statistics gathered by the U. S. Department of Agriculture, 171,624,000 cu.ft. of wood were used in underground mining operations in the United States. This required, at a conservative estimate, the deforestation of 410,000 acres of land, an area more than half that of the state of Rhode Island. In the bituminous-coal fields, the cost for timber alone amounted in that year to 2.3c. per gross ton of coal mined, and in the anthracite-coal fields to 7.7c. The year 1905 was one of comparatively cheap timber, and while no statistics have been compiled since that time, the probabilities are that today with wood at a higher cost per cu.ft., and with larger sizes in use, the cost of mine timbering in wood is about 4c. per gross ton in the bituminous-coal fields as a whole, about 6c. per gross ton in the bituminous-coal regions of Pennsylvania, and about 9c. per gross ton in the anthracite-coal fields.

The cost of wooden mine timbering is not a permanent investment. The life of the timber is so short and the depreciation due to decay and breakage so great that the expense must be charged to maintenance, renewals and replacements and not to capital account. In consequence it must be considered as a fixed charge applicable to each ton of coal mined and increasing in amount for any particular mine as the working faces get farther away from the opening. The more extensively coal is mined, the greater becomes the timbering cost per ton even if the unit cost per cubic foot of timber does not increase. This would not be the case if a material were in use that possessed great durability and was subject to renewal only after long years of service or not at all during the life of the mine. In this case the timbering cost should rightly be charged to capital account with allowance for depreciation.

Satisfactory in great measure as the use of wood has been and will yet be,

these facts show the importance of the problem of mine timbering; and if a change in method can be made that will keep the cost from growing or even diminish the increase, a study of the matter will amply repay the operator. The use of steel in the mines of Warwickshire has cut the timbering cost 2c. per ton, a reduction not to be despised, but more of that later.

The importance of the mine-timbering problem is to be seen further, in the expedients which have been devised to prevent the increase in cost due to use of wood. These expedients are:

1. Methods of mining which either do not require the use of timbering at all or require a minimum amount—Mining without timbers.

2. Methods of reducing cost of wooden mine timbering by prevention of increase in price—Reforestation.

3. Methods of reducing cost of wooden mine timbering by increasing its life—Preservative treatment.

4. Methods of reducing ultimate cost of mine timbering by substitution of other materials for wood—Substitution.

Each of these expedients has its place. Indeed, modern economics require that each of them be given consideration and that no method be used in a place for which it is not in every way the best fitted.

Mining withqut Timbering

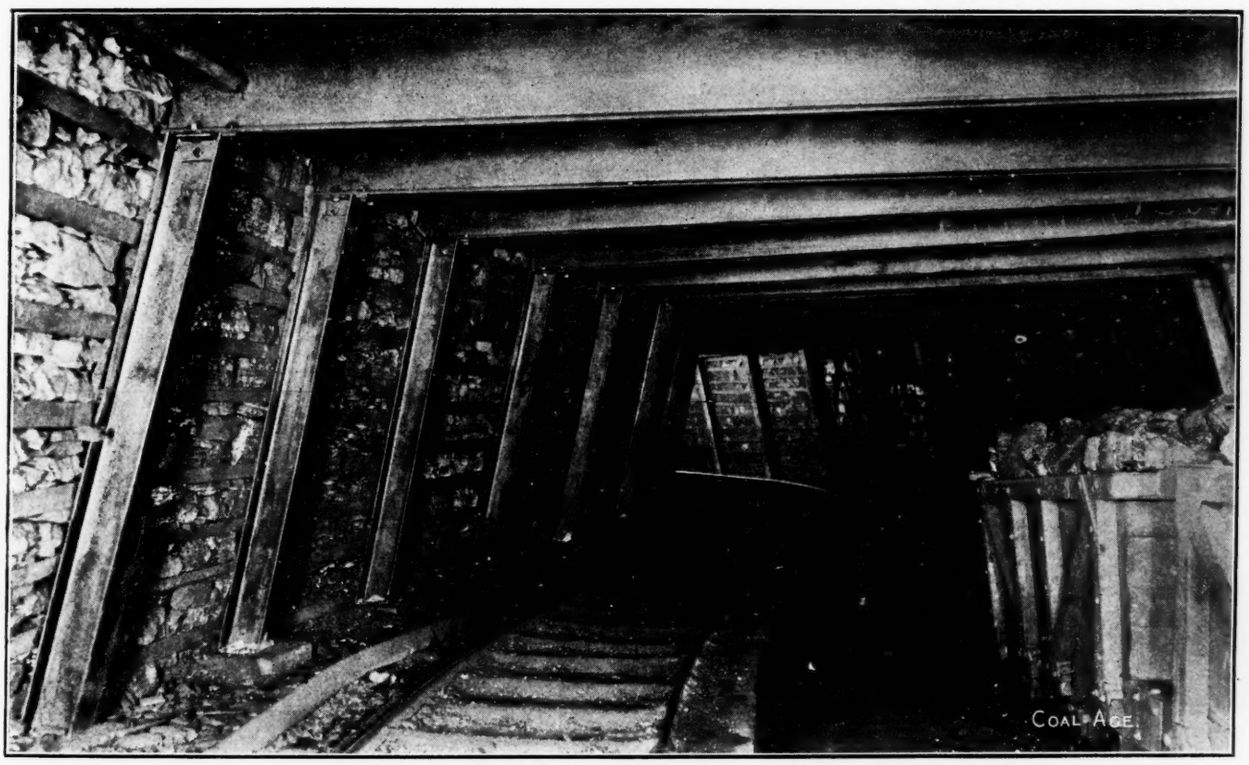
In iron mines operated on the caving system, where the timber is broken and crushed by the fall of the ore or even broken up by dynamite in order to secure the proper subsidence of the roof, top slicing and subslicing have been resorted to in order to get out the ore with more cleanliness and at less expense. In the case of coal, however, these methods would be applicable only to very thick seams and would be objectionable by reason of the fineness to which the product would be broken.

The filling of underground excavations by culm flushing was first tried out in 1891 by Mr. John C. Haddock at the Dodson Colliery of the Plymouth Coal Co.; and the use of culm, clay, sand, etc., for this purpose has come into extended use both at home and abroad under local conditions where the subsidence of the superincumbent strata means a damage and probable property loss which cannot be disregarded.

There are also intimations that the room and pillar system of mining will some day be displaced by the use of the long-wall system, which in the United States has had its most extensive development in Illinois and which has been prosecuted with much success, abroad. The long-wall system of mining, while it does not do away with timbering entirely, makes possible its more economical use by the removal and replacement of the mine-timber sets and, therefore, offers a field for the use of substitutes for wood that are better adapted to frequent removal and replacement.

Reforestation

The chief merits of wood as a material for mine timbers have been its wide distribution and ease of access from the place of use, its consequent cheapness and the simplicity with which it can be framed for use. Its cheapness vanishes when the mines become dependent on far-distant sources of supply. And so the mining companies do well to provide for the future, by taking steps to renew their timber supply and thus make themselves independent both as to the supply and as to its cost. Where, however, the companies do not own the surface land under which they mine, or in case this land is worth more for agriculture than as a forest, the matter is not so simple.



Steel Timbering at Maxwell Colliery, Lehigh & Wilkes-Barre Coal Co.

There is also this other consideration: a wise conservation of our timber resources means the reservation of the best timber for the more delicate and particular purposes of the arts and industries. With the gradual exhaustion of the hardwoods and the species of soft woods peculiarly adapted to architectural uses and to the manufacture of furniture, etc., the cutting of such timber for baser uses may be sheer economic waste. The coal mines, as a rule, are in the hardwood sections of our primeval forests, and their reforested lands, will grow the most valuable species of timber.

Preservative Treatment

The unbiased student of underground mine-timbering conditions is struck at

once by the economic waste involved in the use of wooden timbers in situations where the loading or temperature conditions are such that the wood cannot be expected to last for more than a limited period of time. The two most serious elements of this waste are decay and destruction by insect action. While there is some waste due to the lack of proper proportion between the sizes of the legs and collars in the three-piece gangway set of timbers as ordinarily framed, and while 10 per cent. of all the lumber going into underground operations is wasted in framing and fitting, another 10 per cent. of it is destroyed by insect action and 45 per cent. just simply rots. Insect action may, to a large extent, be eradicated by peeling the timber before it is placed in the mines, but the removal of the bark does not prevent decay, for wherever moisture and heat coexist within the mines, the bacterial agencies of decay, the spores of which are everywhere present in the atmosphere, begin their destructive work.

Proper preservative treatment may reduce disease and decay in mine timbers to a minimum, but it is probably impossible to exterminate the disease and wholly prevent the decay. There seem to be four valid objections to preservative treatment as a final solution of the underground-timber problem:

1. According to the best information at hand, properly treated timber will cost, f.o.b. cars at the mines, two and one-half to three times the cost of timber not treated, and at that will not last half as long as substitutes that can be purchased for less money.

2. If treated at the mines, the time necessary for seasoning the wood before it is ready for treatment and the interest charges on its value during the time of seasoning and treatment involve delay and expense.

3. Much of the timber cannot economically be treated, as it is not economy to apply preservative treatment to material liable to destruction under service conditions by crushing and not by decay.

4. In spite of many years of experimentation, preservative treatment is attended by many difficulties and large uncertainties. The best woods do not take kindly to treatment. It is best adapted to, and most successful with, open porous-grained woods which are of low value from a structural standpoint.

Substitution of Other Materials

Substitution of other materials in place of wood is the solution of a problem in above-ground structures similar to the problem of mine timbering, and there is no valid reason why this solution will not also apply to underground structures. True, wood has not been and will never be entirely displaced above ground; neither will it be below ground. No one material has taken its place above ground; neither will any one material take its place under ground; but it may be predicted that for each condition of mine timbering, that material of construction will eventually be used which experience and accurate study of the economic laws of design indicate to be most suitable, and as a general proposition this material will be steel, since of all other materials it is most like wood in its physical qualities.

The conclusion is reached, therefore, that for the near future at least, the use of timbering within mines will be continued, particularly within the coal mines, and that probably those methods of supporting excavations will never entirely be displaced, which by their simplicity have proved heretofore the most economical and, therefore, the best.

(To be Continued)

Steel Timbers for Roadway and Pump Room, Honey Brook Colliery, Audenried, Penn.

Turbine Driven Feed Pump

The Victor-American Fuel Company is building at Hastings, Colo., and Gallup, N. M., two thoroughly uptodate alternating-current central-station plants for furnishing power to its mines in these two districts. The first installation consists, at each plant, of one 500-kva. Curtis turbo-generator unit, this to be supplemented by a 1000-kva. unit.

One of the novel features of the installation is the use of steam-turbine driven boiler-feed pumps. These are of the Kerr-Alberger three-stage centrifugal type, of 70 gal per min. capacity against 170 lb. pressure. While more costly than others, these pumps are expected to prove economical by reason of their greater efficiency, and saving of repairs.

European Wash House Practice

This is the third and concluding article on the subject. Careful analysis of costs, both of installation and maintenance, are given, together with plan of a typical English plant.

*Abstract of paper appearing in the Iron and Coal Trades Review, London, England.

It has been shown that a large number of the bathing equipments at Belgian collieries have been installed in the Liége district. Owing to their undoubted success, the movement has spread into other districts, such as the Central and Charleroi, where Messrs. Goehmann & Co., of Brussels, who specialize in this type of plant, have laid down a number of important installations.

The total average number of workmen employed in the 43 Belgian pits which have adopted washing installations is 21,560, of which 16,650, or a ratio of 77.3 per cent. regularly avail themselves of the shower-bath equipments. Of the remaining quarter or so of the workers who are irregular in the use of the equipments, or obstinately stand aloof, the majority of these exceptions are due to particular circumstances, such as, for example, their dwellings being close to the pits.

The figures, therefore, indicate that the working class is quite willing to make use of the sanitary accommodations placed at their disposal. The total cost of the 43 installations mentioned has amounted to $358,200. The average outlay per month for working them is $3600, and the average price of one bath is about one cent, excluding interest on capital. In these figures no account is taken of certain smaller installations erected exclusively for the inspecting or managing staff; they refer solely to the equipments for the workmen.

Miscellaneous Notes

Table 1, herewith, kindly placed at our disposal by Mr. Richard Jacobson, who has interested himself greatly in this question, gives some statistics regarding several prominent Belgian mines. It will be seen that in the poorest case, 50 per cent. of the workers make use of the baths, while in more than one instance the whole of the staff use the accommodation provided.

The cost per bath ranges from ½c. to slightly over 1c. In two cases the bathing accommodation is so much appreciated by the workers that they contribute a small amount periodically in order to assist the working expenses. In some of the collieries, canteens are provided near the bath houses, supplying hot coffee, a point of material assistance in preserving the health of the miners who have to go some distance to their homes.

Compulsory legislation on this matter in Belgium only came into force quite recently, yet for some time previous certain mine owners had found themselves compelled to install baths and dressing accommodation in order to prevent their workmen from leaving their pits in favor of those where these advantages were provided.

In some areas the question of water supply is rather a serious one, and where there is this difficulty, means are used to purify the water which has been used by the miners in order to return it to the tanks for reuse. This practice has proved most successful and, in the circumstances, economical.

Shower Baths

From the point of view of time economy, the shower bath enables a man with a minimum consumption of water (7 to 8 gal. per bath) to have a complete wash in a short time, generally ten minutes. The water is supplied at a temperature of 95 to 100 deg. F., and is immediately drained into the underground pipes. This form of washing is complete and quick, as compared with the ordinary bath system, when the cell is constantly engaged at short intervals by a number of men.

The pavement of the bath rooms and dressing rooms is of cement, asphalt, or ceramic tiles, and the cleaning of the same is effected by means of a hose. The principle which prevails in Belgium is to allow each man to have a separate

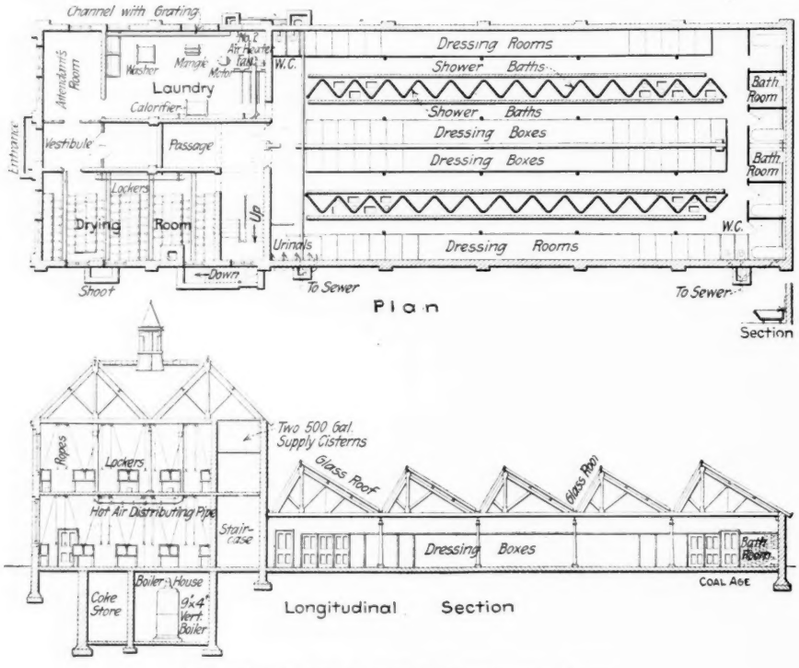
TABLE I. BATH AND DRESSING ROOM INSTALLATIONS IN BELGIAN MINES AND FUEL WORKS

Name of Colliery	No. of Shower Baths	Dressing Accommodation. No. of Hoists	Accommodation for Officials, etc.	Cost, Including Building	Cost, Excluding Building	Cost per Bath	No. of men employed underground	No. of men using accommodation
						(cents)		
Bois du Luc: Quesnoy pit at Trivieres	80	800	.....	$15,600 (excluding cost of site)	....	0.6	420	420
Fontaine L'Eveque: Pit No. 1	22	500	.....	.....	$4,100	0.76	500	250
Pit No. 2	21	600	3 showerbaths and slipper baths for engineers.	.....	7,000	0.76	507	330
Tamines: Ste. Barbe Pit*	20	384 lockers	4 shower baths, 12 lockers, 4 slipper baths	.....	3,500	1.6	334	167
Reunis de la Con orde: Grand Mahets pit	24 (separate building)	400 (separate building)	7 shower baths, 10 ockers	11,700	....	0.8	400	280
Patience-Beaujonc: Fanny pit at Ans	50	600	3 shower baths with slipper baths	10,200	....	0.3	600	425
Bonne Fin: St. Marguerite pit at Liége	49	208 lockers 170 hoists	4 shower baths with slipper baths	5,675	....	0.72	613	416
Abhooz et Bonne-Foi-Hareng: Abhooz pit	30 for men, 6 forwomen	560 hoists, 6 wash-stands, 6 lockers	6 shower baths, 17 lockers, 2 slipper baths	10,700	....	0.7	449	449
Milmort pit	30 for men, 6 forwomen	524 hoists, 8 wash-stands, 8 bath tubs	2 shower baths, 2 slipper baths	11,200†	....	0.7	440	440

*Four buildings: One for men, 1 for women, 1 for superintendents and 1 for engineers.
†This includes three separate buildings: One for men, 1 for women, 1 for superintendents, with laundries and accommodation for meals.

cell with one or two compartments; the partitions are of plain or corrugated sheet iron, porcelain, marble, or thick glass. In general the workman only dresses partially in the cell and finishes up outside on benches fitted against the lockers and clothes hoists.

The protection, drying and ventilation of the clothes are done in two different ways: (1) In metallic lockers well ventilated for this purpose, and constructed of expanded or perforated metal; (2) on hanging apparatus provided with hooks, and working by means of pulleys, by which they are hoisted to the ceiling[1]. On the basis of Belgian experience, Mr. Jacobson has made an estimate of the cost of a shower bath, lavatory and dressing-room installation for 100 men in an industrial establishment, such as a patent-fuel works. This is shown in Table 2.



MINERS' BATHS AT THE WINNINGTON MINES

BRUNNER, MOND & CO.'S INSTALLATION

Up to the present the subject of industrial bath establishments has not made much progress in England, although the question is now being investigated.

Probably, however, the most complete and important British installation of this nature which has yet been made is that designed and constructed by the Leeds Fireclay Co., Ltd., of Wortley, Leeds, for the works at Winnington of Messrs. Brunner, Mond & Co., Ltd. The general arrangement of this scheme, including baths, dressing rooms, drying rooms and laundry, is shown in the accompanying drawing, and numerous differences in arrangement will be noticed as compared with the Belgian designs.

The zig-zag cubicle was designed with a view of saving not only space but a considerable expense in the length of the building. The widest part of the cubicle is 6 ft., and as 4 ft. clear is really necessary to allow an adult to scrub himself down freely, it will be seen that this innovation has effected a most important saving in space, and, moreover, there is no wall surface lost.

The footbaths are made in fireclay, and sunk flush with the floor, the wastes discharging into an open channel covered with a galvanized-iron grating. The seat in the angle is also made in fireclay, and the floor falls all round toward the footbath, the floors in the dressing cubicles then falling toward the channel, so that the whole place can be cleaned out with a hose. The user has full control of the shower, by means of a patent valve by which the cold water must be turned on before the hot, so as to reduce the possibility of scalding as far as possible. The hot- and cold-water service runs round the cubicles, and is utilized to hang the waterproof curtains.

The dressing boxes are constructed in wood with the partitions standing well clear of the floor so that a hose can be used with freedom. At the end of the building there are six slipper baths with large outlets and quick-filling valves. The partitions in these baths are constructed in "Shepwood" brick, supported clear of the floor with girders.

The whole building is heated with steam pipes in the winter months. Sanitary accommodation is also provided in the way of four closets and four urinals. Fixed throughout the building there are also hose taps so that the place can be easily washed down, and the ventilation is arranged to rapidly get rid of steam.

GENERAL DETAILS

The hot and cold services to the baths are supplied from a storage in the roof, and through a large heater situated in the laundry. In connection with the latter there is also a large hot-water storage, such that the maximum demand can be met continuously for some hours. The laundry is equipped with a washing machine, tubs, a set of drying horses, mangle, etc., so that the washing of towels can be accomplished with the minimum of labor. The steam for this and the heating of the building generally is furnished from a vertical boiler.

There are two drying rooms, one on the ground floor and one on the upper floor; they contain 200 cupboards supported clear of the floor, each numbered and furnished with a key. Above each cupboard there are provided quadruple hooks, the rope of which works through a pulley secured to the ceiling. The end of the rope passes through the top of the cupboard and is secured to the interior by a hook so that the clothes cannot be lowered by anyone not in possession of the cupboard key. By a suitable fan driving hot air into and across the rooms, wet clothes can be dried in an hour or two. As regards operating cost, it has been found in practice that one man is sufficient to work the whole place.

TABLE 2. ESTIMATED COST OF A SHOWER BATH, LAVATORY, AND DRESSING-ROOM INSTALLATION FOR 100 MEN FOR PATENT-FUEL WORKS

A—Instailation with the Most Needed Requisites		B—Installation More Luxuriously Furnished	
Heating	$296	Heating	$296
Hot-water supply and shower baths	365	Hot-water supply and shower baths	365
Lavatory basins and wash-stands	178	Lavatory basins and wash-stands	178
Clothes hoists	197	Clothes hoists	197
Ventilation	65	Supplement 1.	18
Shower bath cells (in galv. sheet iron)	292	Supplement 2.	117
Miscellaneous	58	Ventilation	65
Steam and water from the boiler.	122	Shower-bath cells (in glazed bricks)	757
Building	1703	Supplement 1.	144
	$3276	Supplement 2.	192
		Lining, shower-bath room	84
		Dressing room.	214
		Miscellaneous	68
		Steam and water from the boiler	146
		Building	2433
			$5274

COST PER ANNUM FOR MAINTENANCE (APPROXIMATE)

Attendant's salary	$350
Overalls	487
Towels	97
Soap	146
Laundrying of overalls and towels	730
Cost for water and steam	243
	$2053

$$\frac{\$2053}{100} = \$20.53 \text{ per man}$$

[1] A recent law enacted has made the use of these hoists prohibitive because of the danger due to articles falling from the pockets of the clothes.—Editor.

United Mine Workers' Convention

After adopting a policy to be followed out in negotiating a wage-scale agreement, and after selecting Indianapolis as the place for holding the next convention in 1914, the United Mine Workers of America adjourned their convention at noon, Feb. 2.

The committee on policy reported that the method of negotiating wage contracts that has been followed for some years past, has proved entirely too expensive because of the fact that large delegations have been kept waiting for days and sometimes weeks for the scale committee to report. It was recommended that authority be given to the miners' scale committee to negotiate an agreement, with the understanding, however, that the proposed contract be submitted to a referendum vote of the union membership, or to a reconvened convention, and this action was accordingly taken.

One of the most important accomplishments of the convention was the adoption of a constitutional provision for holding their conventions and elections of national officers biennially. Edwin Perry, secretary-treasurer of the organization, has compiled figures showing the cost of the present international convention to be $180,000.

Joint Scale Conference Adjourns

The joint-scale committee reported that the demands of the miners and operators were so diametrically opposed that there was no chance of reaching an agreement at this time, and adjourned indefinitely on Feb. 1. A committee composed of President White for the miners, and an operator and a miner from each of the four states represented in the conference, was appointed to entertain any proposition that might be submitted by either side and empowered to call the conference to reassemble if an agreement seemed possible.

There was little or no talk of a strike to be called after Apr. 1 in case an agreement has not been reached before that time, and it was admitted by the miners that the organization was not in condition financially to carry on a long strike.

The operators, in the joint conference, took a most decided stand against the introduction of the unlimited "check-off" system demanded by the miners. This would require the employers to deduct from a miner's wages any sum that the organization might demand that he pay to the treasurer of the local union. The operators expressed themselves as willing to check off the regular dues of the miners, but refused to have anything to do with any other assessments levied by the organization. The continuance of the scale committee with implied orders to keep up negotiations is construed to mean that there may be a compromise.

Coal Law Needs Amending

The present coal-land law has one serious defect, which should be remedied if a leasing law is not enacted. The restriction of area that may legally be acquired to a maximum of 160 acres for an individual and 640 acres for an association is not in accord with good mining practice. The fixed charges on the cost of a modern coal mine, provided with the uptodate equipment necessary to conserve life and property and to assure maximum recovery, are too high to be assessed against the output of so small a tract, especially if the coal seam is of only moderate thickness. A law designed to promote the practical utilization of coal deposits, whether the system contemplates sale or lease, must provide for the holding of a large enough unit to permit the opening and equipment of a modern mine and to warrant its economical operation. Without such provision for commercial operation too great an advantage is given to the land-grant railroads and large coal companies already in possession of considerable areas of high-grade coal. (From 32d Annual Report, Director United States Geological Survey.)

Alabama Examinations for Mine Foremen and Firebosses

The Alabama state examinations for first- and second-class mine foremen and fire bosses were held in Birmingham, Jan. 22 to 26 inclusive. C. H. Nesbit, chief mine inspector, has made public the list of applicants who have been successful in passing the examinations. The highest percentage, 89.5, was averaged by G. L. Cunningham of Dolomite; the second highest, 89, by H. G. Hubbard and T. H. Black, both of Maben, while the third highest, 88, was credited to M. F. Bell, of Blocton. All of these filed applications for the certificate of first-class mine foreman.

The following will be awarded certificates by the board of examiners and will be exempt from further examination in their respective classes:

First Class Mine Foremen—John Reynolds, Dolomite; G. L. Cunningham, Dolomite; Will Smith, Bell Sumter; Will Herring, Bell Sumter; J. O. Seigler, Margaret; J. M. Ware, Dolomite; J. B. Hunter, Altoona; S. B. Kennedy, Johns; G. L. Nesbitt, North Birmingham; T. H. Black, Maben; H. H. Hubbard, Maben; G. W. Caviness, Cordova; H. C. Wood, Blocton; J. H. Lawrence, West Blocton; John Kuffner, Blocton; John Fullman, Coleanor; M. F. Bell, Blocton; J. H. Gardner, Samoset; James Kirkpatrick, Wylam; M. D. Drennen, Palos; J. L. Bryson, Margaret; C. C. Custered, Margaret.

Second Class Mine Foremen—Opie Gamble, Delmar; John Oliver, Natural Bridge; W. L. Smith, Altoona; W. R. Gibbs, Warrior; W. W. Earnest, Coal Valley; L. F. Taylor, Altoona.

Fire Bosses—Thomas Gilmore, Pratt City; Will Chatman, Blossburg; Mathew Howard, Adamsville; Gus Burkhart, Adamsville; C. G. Ellison, Bell Sumter; M. M. Barron, Dora; William Ellis, Wylam; W. D. Millstead, Dolomite; J. D. Dunlap, Margaret; Tom Ellis, Wylam; R. L. Hutton, Glen Carbon; William W. Lewis, Dolomite; James Stewart, Cardiff; Robert Hartley, Piper; J. A. Ivie, Coleanor; Marvin Henderson, Mulga; Richard Hopkins, Johns; J. M. Robinson, Blossburg; C. B. Jones, Margaret; George Smith, Abernant; J. J. Burnett, Dora; John Waine, J. W. Adams, Robert Lewis, J. A. Hartley, J. M. Townley, F. Tune and W. B. Brown.

Fuse and Squibs

Knowing that mining accidents often result from trivial causes other than the actual use of explosives themselves, the U. S. Bureau of Mines has just completed investigations of fuse and miners' squibs and the rate of burning of the former as influenced by temperature and pressure. The results are contained in Technical Paper No. 7, "Investigations of Fuse and Miners' Squibs," by Clarence Hall and Spencer P. Howell, and Technical Paper No. 6, "The Rate of Burning of Fuse," by Walter O. Snelling and Willard C. Cope.

The technical paper on investigations of fuse and miners' squibs, by Clarence Hall is one of a series of publications published for the use of miners, tunnelers and quarrymen and its purpose is to enable those in charge of blasting work to select the best devices for igniting explosives, thus aiding in the reduction of accidents.

The author says: "The rates of burning of the various kinds of fuse sold in this country vary from 18 to 40 sec. per ft. in open air. However, the miner or shotfirer seldom knows the rapidity with which different kinds of fuse will burn. It is true that some fuse is marked slow or fast and is even distinguished by the color of the paper wrapper, but this is not always the case. Without such information a miner who is accustomed to a certain brand of fuse may use another that burns faster with the result that a charge may explode prematurely and menace all connected with the work. However, it is believed that the rate approved by the Bureau of Mines—namely, 90 sec. per yd.—will meet the various mining conditions in this country.

Careful tests should be made of the rate of burning of fuse whenever there is any doubt as to its soundness. The manufacturers may produce a fuse with a regular rate of burning, but the rate may be changed by bad handling—for instance, by squeezing it so as to disturb the powder train, or by suddenly and roughly opening the coil when it is stiff from cold so as to crack it—or it may be bruised by rubbing against the rough surface of rock."

"Fuse should be carefully handled and never laid in a damp place before using. In cutting and fitting it into place, care must be taken that the powder core does not run out of the fuse, for that might cause a misfire. The fuse should be cut straight across with a sharp knife, just before placing the end in the detonator and in a humid atmosphere at least 1 in. should be removed to insure unfailing detonation. The fuse should be fitted gently into the detonator which should then be crimped on the fuse by a suitable crimper."

The conclusions reached in the investigations into the rate of burning fuse, Technical Paper No. 6, show that it is important for time fuse to have a uniform rate of burning, and in almost all blasting operations the fuse which is used is assumed to burn in a regular and uniform manner.

When fuse has been subjected to such conditions as produce acceleration or retardation in its rate of burning it becomes dangerous. Rapidity in burning increases the liability that the shot will explode before the miner has left the face; slow burning increases the possibility that the flame in the fuse will progress so slowly that the miner may be injured by a delayed shot when he returns to the working face. Any marked change in the rate of burning of time fuse is dangerous, and from a study of the list of accidents in mines and quarries each year, it would seem that injury and loss of life are often brought about by such changes.

Under ordinary conditions nearly all types of fuse show great uniformity in their rate of burning. Practically all kinds of fuse examined in connection with the preparation of this report had a total variation in their burning under normal conditions of less than 20 per cent. and all would have been passed under the requirement stipulating "no variation greater than 10 per cent. above or 10 per cent. below the average rate of burning."

Climatic conditions affect to a considerable extent the rate of burning of the less waterproof types of time fuse. Damp fuse burns more slowly than normal fuse, and fuse that has been wet and then thoroughly dried tends to burn at a rather slow rate, and may even cause delayed shots by smoldering for a considerable time. Fuses containing several wrappings of tape saturated with tar or asphalt resist moisture to a considerable extent, and may be used for firing shots under water, provided the fuse is not allowed to remain too long a time in contact with water before the shot is fired.

Copies of the technical papers may be obtained by applying to the Director of the Bureau of Mines, Washington, D. C.

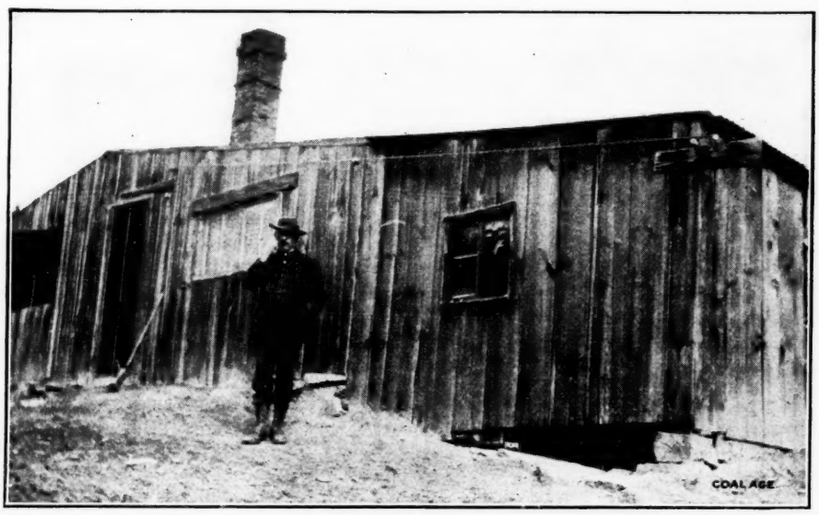
Program of the Bureau of Mines

The report of the Secretary of the Interior recommends the addition of two or three more mine-safety cars to the present equipment of the Bureau of Mines. Cars are now stationed at Billings, Mont., Trinidad, Colo., Evansville, Ind., Huntingdon, W. Va., Pittsburg, Penn., and Wilkes-Barre, Penn. Besides these six cars is one dividing its time between Rock Springs, Wyo., and Salt Lake City, Utah. The six mine-rescue stations are at Pittsburg, Penn., Knoxville, Tenn., Birmingham, Ala., McAlester, Okla., Urbana, Ill., and Seattle, Wash.

The secretary urges that the Bureau of Mines be empowered to collect and publish statistical data, and in a concluding paragraph declares that "the buildings and grounds at Pittsburg now occupied by the Bureau of Mines, for its investigations, are inadequate for its needs, unsuited to its purposes, and are held subject to the wishes and needs of another department of the government.

Western Hospitality

Western hospitality is not limited by its surroundings. The accompanying photograph shows the first boarding house of the International Coal Co., of Montana. In spite of its rough appearance, it was very clean and comfortable inside, and the meals served would have done justice to any first-class café. It is needless to say that this has now been replaced by a larger and better-looking structure.



TYPE OF BOARDING HOUSE FREQUENTLY MET IN WESTERN CAMPS

British Coal in Spain

The British consul, in a report on the trade of the consular districts of Bilbas for the year 1910, says the consumption of coal in Bilbas and neighborhood during the year amounted to 778,312 metric tons, made up of 465,135 tons from the United Kingdom and 313,177 tons from Spanish mines. Covering a period of three years the consumption of coal in this district is shown in metric tons in the table herewith, including the country of origin:

	1908	1909	1910
United Kingdom	459,360	460,761	465,135
Germany	.....	411	.....
Spain	291,698	268,623	313,177
Total	751,058	729,795	778,312

In this market, as will be observed, British coal more than maintained its position, chiefly due to increased imports of North Country "smalls" for coking by the iron and steel works. In recent years there has been a tendency to consume smaller quantities of Spanish fuel, but last year's figures show a notable change, resulting in an increase of 44,554 tons, as compared with 1909. This also is largely attributed to greater consumption in the local coking ovens. The patent-fuel works, recently erected at Luchana, also consume Asturian "smalls," so accounting for a portion of the increase. The British coal is chiefly imported from Newcastle and Newport. There does not appear to be a wide margin in the quoted price per ton, as in June, 1911, the quotations were: Newcastle large, $5.71; small, $4.06; Newport large, $5.99; small, $4.58; Spanish large, $5.55; small, $3.78.

From San Sebastian the vice-consul reports that last year 26,666 tons of British coal were imported and 85,070 tons of national coal from the Asturian mines. He notes with regret that the quantity of British coal delivered at this port compares so unfavorably with that of national coal. Although the former is of much superior quality and practically of equal price with the latter, the manufacturers for the most part give the preference to the Spanish coal, the probable reasons being: (1) The coal is delivered in handy quantities; (2) it is quick burning, thus giving less work to the fireman; (3) patriotic motives.

What's in a Name?

By R. W. Raymond*

When our institute was organized, the rules of the North of England Institute of Mining Engineers were adopted for temporary use, and its name was copied without debate. The rules were soon after rewritten to suit the conditions of our society; but the name remained unchanged. The North of England Institute was, in fact as in title, made up of mining engineers—mostly colliery managers—whereas the American Institute included from the beginning the representatives of metallurgy, chemistry, mechanical engineering, geology—in fact, all the arts and sciences auxiliary to mining.

That no change of name was made in the early years was due, I think, largely to the feeling that it was better to let the term mining engineers cover the whole field than to create a long and cumbrous title by attempting to state in it all the branches represented in our membership and proceedings. It was deemed unnecessary to make a complete table of contents out of a title page.

After a few years, there was another reason for conservatism in this respect, namely: the members of the institute became fond of its name, and listened with impatience to any proposal of amendment. It was, at the worst, they said, a lucky misnomer, under which the institute had prospered, and the wide range of activities covered by it was well understood throughout the world. Moreover, although an institute, strictly speaking, was not a body of men, yet this institute "of mining engineers" was just that; and the fellowship of its human members was as important and as dear as the information contained in its volumes. Finally, a good many of us remembered from our school days the old maxim that when a debating society of boys began to tinker its constitution and change its name, it was pretty sure to be moribund; and we had seen the same phenomenon in struggling periodicals, and even in the history of nations.

Having been asked from many quarters to express my opinion concerning the present proposal to change the name of the institute, I must say frankly that I have no strong opinion one way or the other, apart from the consideration of sentiment and habit, which would have weight only with the old members who, like myself, are soon to pass from activity. When the institute was organized, I do not think I would have objected to any respectable designation; but having loved it long under the name by which it happened to be baptized, I might naturally find difficulty in transferring my affections to another. And I confess that the substitution of impersonal abstractions, like "Mining and Metallurgy," for a term of personality, like "Mining Engineers," seems to me somewhat chilly, and to put us somewhat out of touch with our sister national societies of civil, mechanical and electrical engineers.

Yet the proposed title is perhaps better English than the old one; and if it will give deeper satisfaction, arouse more enthusiasm, command wider support and lead to better work, by all means let the new label be pasted over the one that has been with us round the world. It is really a small matter, unless it be made a large one by over-estimating its importance. And my advice to everybody is, to vote with the majority! Only, do not stop satisfied with a mere pedantic improvement, but go ahead with all your might to make the married as glorious as the maiden name!

The disinterested character of my advice may be inferred from the circumstance that my election as honorary member of the institute deprives me of the right to vote, and therefore I must preserve the dignified attitude of a veteran observer only.

*Secretary Emeritus of the American Institute of Mining Engineers, New York.

American Institute of Mining Engineers

On Jan. 27, a meeting was held in Washington of the members of the American Institute of Mining Engineers, who are also members of the U. S. Geological Survey, to consider the proposed amendments to the constitution of the institute. At this meeting were present, G. H. Ashley, state geologist of Tennessee; G. F. Becker; A. H. Brooks; E. F. Burchard; R. H. Chapman; Frank L. Hess; W. Lindgren; H. D. McCaskey; E. W. Parker; F. L. Ransome; C. E. Siebenthal; George Otis Smith; A. C. Spencer; D. B. Sterrett. Arnold Hague was prevented from attending, but he, as well as George P. Merrill, of the Nation Museum, and J. A. Holmes, of the Bureau of Mines, desire to express their concurrence in the action taken.

The following resolutions were passed after full discussion and without a single dissentient vote:

The members of the American Institute of Mining Engineers present do not approve of the proposed change of name of the Institute to "American Institute of Mining and Metallurgy."

The members of the American Institute of Mining Engineers present are not in favor of the change in classification of members on the basis proposed in the circular, which is not a reclassification based upon professional standing.

In the absence of a financial statement showing that an increased income is necessary, the members present are opposed to the proposed increase in dues.

A committee was also appointed to communicate the resolutions to the mining press in the hope of eliciting expressions of opinion. This committee consisted of Waldemar Lindgren, George F. Becker and A. H. Brooks.

Cause of the Wyoming Explosion

After a thorough examination by a number of the leading coal men in Wyoming, it is the consensus of opinion that the explosion at Susie, on Jan. 20, was due to a blown-out shot, as already noted in Coal Age, Vol. 1, p. 516.

The particular shots to which the cause of the explosion is attributed, were in room 8, in the second north entry. Two shots were fired in this room at about the time of the explosion, and it is possible that they were both fired simultaneously. The holes were drilled at right angles to each other, and there was evidence that one of the shots was "windy" or "blown-out." The mine has never been known to show any firedamp, which further strengthens the theory of a dust explosion. That the possibility of such an occurrence was appreciated by the management is shown by the fact that the mine was provided with a complete watering system for sprinkling; to this fact is attributed the local character of the explosion.

The coroner's jury examined a number of the leading coal men in the West, who were present shortly after the explosion, and found: "That the deceased came to their death by burns and asphyxiation, caused by the explosion, which might have been avoided by the proper placing of the shot."

According to the latest reports the fatality list totals 6 men, which includes those who died of their injuries since the explosion.

Switchboards for Small Plants

In small isolated plants and central stations it is desirable to keep the initial investment low and yet provide good service. To meet this condition, the General Electric Co. has placed on the market a line of small switchboards ranging in capacity from 1 kw. at 125 volts to 200 kw. at 250 volts.

The panels are made of dull black marine-finished slate, and are furnished with the necessary copper connections between busses, switches and circuit breakers, when the latter are supplied, together with the wiring on the back of the board.

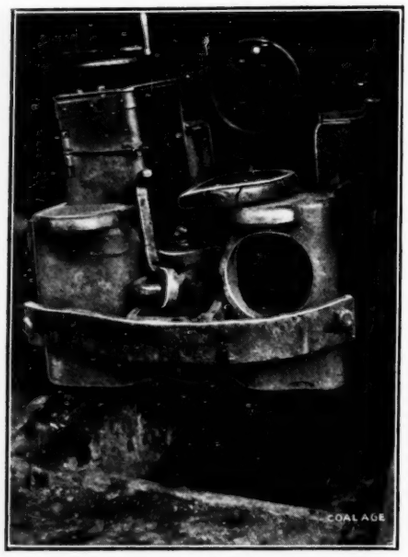
The instruments also have dull black finish and the current carrying parts on the front of the panels are polished and lacquered.

A complete supporting framework with necessary fittings is furnished with each panel, the small panels for wall mounting being provided with malleable-iron supports, while those for installation on the floor are provided with pipe supports.

Bulletin 4903 contains illustrations and descriptions of this line of panels in addition to complete information for ordering.

Good Service from a Mine Locomotive

The argument that good machinery needs proper care would seem to be denied in the locomotive shown in the accompanying cut. This locomotive has been running for five years in a Western mine. Operating on heavy grades, it has had a number of runaways, and the main frame has been repeatedly cracked.



SHOWING MINE LOCOMOTIVE AFTER HARD USAGE

In spite of its dilapidated condition, it is still in daily operation, and is doing its work with little trouble. As an example of how much abuse mining machinery and electric locomotives in particular will stand, this locomotive is a valuable exhibit.

Twenty-first Bituminous District, Pennsylvania

BY F. W. CUNNINGHAM*

The production of coal from this district, considering the depression of the industry in general, was above expectation, exceeding the tonnage from the same mines for 1909 by 17,442 tons, but falling 129,799 tons short of that produced in 1910. The dropping of the tonnage is accounted for in this district, partly by the fact that several of the mines are nearly exhausted and cannot maintain their usual output. One new mine is being opened by the Warner-Leonard Coal Co., near Fayette City, which, if its plans are carried out, will be a large producer.

There were 35 fatal accidents in the mines, being four less than in 1910. The accidents occurred from the following causes: 57.14 per cent. by falls of slate, coal and roof, being 4.40 per cent. below 1910; 28.58 per cent. by mine cars; 2.86 per cent. by blasts of dynamite; 11.42 per cent. by electricity. There were no accidents caused by explosion of gas or of coal dust.

The mines were never in better sanitary condition, or more carefully looked after by the mine officials than they are at the present time, and they are in condition to run a larger tonnage.

PRODUCTION OF COAL

Names of operators	Tons
Monongahela River Consolidated Coal & Coke Co.	3,721,742
Vesta Coal Co.	1,896,145
Pittsburg Coal Co.	652,088
Naomi Coal Co.	266,250
Warner-Leonard Coal Co.	161,671
The Harris-Smith Coal & Coke Co.	18,015
Total	6,715,911

PRODUCTION BY COUNTIES

Washington	3,445,357
Fayette	3,270,554
Total	6,715,911

GENERAL STATISTICS

Number of mines	22
Number of mines in operation	19
Number of tons of coal shipped to market	6,584,928
Number of tons used at mines for steam and heat	118,077
Number of tons sold to local trade and used by employees	12,906
Number of tons of coal produced	6,715,911
Number of tons of coal produced by pick mining	2,044,210
Number of tons produced by electrical machines	4,671,701
Number of persons employed inside of mines	6,154
Number of persons employed outside, including coke workers	800
Number of fatal accidents inside of mines	35
Number of nonfatal accidents inside of mines	37
Number of non-fatal accidents outside	1
Number of tons of coal produced per fatal accident inside	191,883

*Mine inspector, twenty-first bituminous district of Pennsylvania.

Face Guard for Mining Stock

At the present time a great deal of attention is being paid in Great Britain to the physical condition of horses and ponies employed underground, and much is now being done to remove those objections which have been made to the careless treatment which is said in some cases to have been meted out to them. One indication of this admirable movement is shown in the illustration which gives a rough drawing of an eye protector guard which is being made by George Burnside, of Shiney Row, Fence Houses, in the County of Durham. The loss of an eye is, of course, one of the most painful accidents which can happen to an animal underground. Once a pony loses an eye, probably half the value of the animal is lost.

It consists either of copper or galvanized wire woven into a suitable mesh with rims and adjustments or straps for attachment to the bridle. All the wire ends are woven round the outer rims, and the protector being shaped to suit the eye is of great strength without having any needless weight. Should the horse or pony come into collision with any obstacle, such as a wooden door, the resistance is taken by means of the plate fixed to the guard, which plate takes its bearing on a leather strap which is attached to the bridle and comes down the forehead and face. It also has adjustments in the form of buckles which are attached to the outer rim of the guard.

The buckles which engage the straps attached to the bridle on the cheeks of the animal prevent the guard from touching any part of the head, and thus the horse or pony receives the force of the blow without any pain or fear of any damage to the eyes. The guard is attached to the bridle with suitable straps which can be easily removed for repairs without removing the bridle from the pony, and are suitable for fixing to any existing bridles. As the device is well ventilated it is cool, and this is a matter of great importance. There is, moreover, no interference with the sight, as the horses or ponies have their full front and side sights. This feature is most necessary as the side sight is important to underground animals, much turning having to be done in narrow spaces.

HORSE FITTED WITH AN EYE PROTECTOR

It is often found that ponies are nervous after accidents, and a valuable provision is made so that the bridle need not be removed in case the guard needs reblocking. In order to facilitate reshaping, hard-wood blocks are provided and mounted at the stable, which are so formed as to correct the distortion of the guard and to fit it when molded to its proper shape. A common cause of tender eyes in animals employed for underground haulage, is the lashing of wet canvas doors against their eyes, and the protector shown effectively obviates this.

The mesh which is usually adopted is 5/8 in., but this can be varied to suit local circumstances, and in some cases aluminum guards have been substituted for copper or iron. This simplicity of adjustment to existing bridles is a great feature in its favor, and it can therefore be imagined that the device is a great boon to underground horses and ponies.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Ventilation in Sinking Shafts

R. A. S. Redmayne, the chief inspector of mines in Great Britain, gives an account of the accident at the Thorne colliery, Yorkshire, England, which illustrates the care which should be used in ventilating shafts during the sinking process. He says that an accident occurred, Mar. 16, 1910, at Thorne colliery, when sinking operations were being carried on to reach the Barnsley bed. The shaft was 22 ft. in diameter, and was only 120 ft. deep at the time of the accident. A round of 15 shots in the bottom of the pit had been fired by an electric battery, each shot containing 1¼ lb. of gelignite. Immediately after the firing of the shot a foreman and laborers descended the pit in a hoisting bucket ("bowk"). On reaching the bottom of the shaft, about five or six minutes after the shot had been fired, the men began to cough, and several of them became very weak and ill.

A second gang of laborers descended and reached the bottom of the shaft about 15 min. after the first gang, and one or two of them were also affected by the fumes. During the shift several of the first gang became so ill that they had to cling to the rings of the shaft; but the significance of the symptoms mentioned was not realized by either the men themselves or those in charge of the work. The men temporarily recovered, with one exception, this man going to the surface an hour before the completion of the shift; the rest worked about three hours after the firing of the charge mentioned above. Then they went home, but during the night several of them became seriously ill, and one died about the middle of the next day (Mar. 17).

All the men who went down in the first bucket, and one at least of those in the second bucket, developed similar symptoms. No mechanical means had been taken to produce a ventilating current in the shaft, and the heat of the steam pipes used therein caused a current of air, which was depended upon to ventilate the workings. The shaft was wet; the amount of water being made being about 120,000 gal. per hour.

The symptoms show that those of the men who were affected by the poisonous fumes of the shot were suffering from the effect of carbon monoxide, and nitrous oxide poisoning. Prominent among these symptoms was a confusion of thought and expression, even when the persons affected thought themselves quite well (pointing to the presence of carbon monoxide), and violent coughing (pointing to nitrous-oxide poisoning). The inferences which may be drawn from this case are the following: That carbon monoxide was responsible for the more immediate symptoms, and the nitrous fumes for the bronchitis.

In Cornish mines, where it is seldom that more than 4 or 5 lb. of gelignite are fired at one time, cases of "gassing" are rare. On the other hand, accidents of this sort are common in the Transvaal, where heavy rounds of explosives of the nitroglycerin class are fired, and carbon monoxide is as often the cause of death as nitrous fumes, the latter being dangerous when a charge has failed to detonate.

But even with the best obtainable ventilation and the best quality of explosives, the conditions characterizing the present case would be risky, and it is remarkable that with such heavy rounds of shots that there had not been trouble at this work before. Possibly the explanation lies in the fact that the shaft not being so deep, the fumes cleared away sooner than was the case at the time of the accident; but it may have been due to the fact that the men did not, on previous occasions, descend to the bottom of the shaft so soon after the firing of the rounds of shots. Perhaps, too, on the fatal occasion, the climatic conditions were such as operated against the rapid carrying away of the fumes.

Briquetting Machines

We are indebted to *The Iron and Coal Trades Review* for the following descriptions of two large coal briquetting machines for installation in a South Wales briquet manufactory. One machine is the largest double-pressure briquet machine built in England up to the present time for the manufacture of briquets from bituminous fuel. Two 25-pound briquets can be made per stroke, the edges being beveled, and the briquets being branded on both sides. The output is about 25 tons per hour, equal to some 2200 briquets per day. The machine is extremely heavy, as may be well understood when it is noted that it will exert a total pressure of 320 tons upon the briquet.

Another machine, also made by Robert Middletown, of Sheepscar Foundry, Leeds, is built for the manufacture of small nut fuel, and can be designed to make blocks weighing from one to four ounces. Its output is from 10 to 15 tons per hour, according to the weight of the block produced. As usual, the molds are sunk in tires, being so arranged that the whole face of the roller is covered by the depressions, in which the material to be compressed is allowed to run. There are four rollers, two at each end of the machine with gears between them. The roller faces are made of steel, and after having the cups or molds carefully cut and polished in them, are heavily case-hardened before being pressed onto the steel centers which carry them. The gearing is cut so that the cups come together. The bearings or brackets are very heavy, and the rollers are adjusted by wedges. The machine described requires only 15 to 20 horsepower for operation.

Grounding

The discussion of a paper on "Earthing, Earth Plates and Earth Detectors," by T. W. Ellis, at a recent meeting of the South Wales Branch of the Association of Mining Electrical Engineers of Great Britain, contained some interesting facts.

Sands and gravels appear to conduct principally by the moisture and damp clay in the interstices, but clays have a true conductivity, some of them giving less resistance than the water with which they are moistened. Some rocks have a conductivity depending not only on the water they contain, but also upon the nature of the rocks themselves.

RESISTANCES OF NATURAL GROUNDS

Natural conductor	Ohms per c.c.
Fresh rainwater	12,000
Stream, well and river water	2,400
Thames water (at London Bridge)	2,130
Sea water	350
Saturated solution of lime water	750
London blue clay	870
London red clay	950
Clay with sand	1,900 or over
Plastic clay	1,900
Same clay (dry)	1,850
Silver sand	6,400
Ordinary river sand	19,000
Whiting (levigated chalk)	1,900

These figures suggest that the excellent conductivities of clays are due to the fineness of their constituents and not so much to the conductivities of the particles themselves. Temperature is also a factor; water at 60 deg. F., which had a resistance of 2400 ohms, fell to 1400 ohms at 150 deg. F.

Long continued action of electric current lowered the resistance of soils, while a rest raised the resistance.

The resistance of a ground-plate 2½ ft. square is about ¾ of an ohm, if

sunk in the sea, 3 ohms if buried in pure clays, 10 to 15 ohms if in mixtures of both gravels and clays, and as high as 40 ohms when sunk in some mixtures of sands and gravels or of porous rocks. The least resistance of an earth connection that Mr. Ellis has yet measured was 7 ohms, and the mean resistance of a large number of measurements was between 15 and 20 ohms. In sinking a ground-plate, it is necessary to put it sufficiently deep to insure its being surrounded the whole year with soil saturated with moisture. It should be sunk in a hollow, and, if possible, beside a constantly running stream, with the top of the plate below the level of the bed of the watercourse. If sunk near a drain the plate should be placed near its under surface. If there are gas and water pipes, it should, where possible, be connected to them. Of course, a connection to a gas or water main is sufficient where such pipe is not likely to be cut for repairs. The resistance of an earth connection made to a water line may be but a fraction of an ohm. A number of small plates, sunk some distance apart, are a more efficient earth connection than one large one. They are still more effectual if the conducting layer of soil is shallow.

Weldless Chains

In a paper read by A. D. Strathern, on "Weldless Steel Chains for Mining and General Purposes," before the Manchester Geological and Mining Society, he said: "It is now fully 100 years since the ordinary oval-link welded iron chain was produced commercially. Robert Flynn, an Irish blacksmith, commenced making such chains at his forge in North Shields, in the year 1808, and from that time the chain-making industry has grown steadily until it now holds an important place in the world's manufactures. Stud-link chains, as used for ships' cables, were introduced in the year 1812 by Lieut. Brown, but since then practically no improvement has taken place in the manufacture of ordinary welded iron chains. Defects which experience has shown to be most common in welded-iron chains are: first, defective welds; second, the excesive weight of the chain, as compared with its strength; third, the absence of any allowance for wear on those parts most subject to abrasion; fourth, the want of a uniform standard of quality. In most cases, chains wear at the end of the links, where they bear upon each other; consequently the correct theoretical and practical design is to make the ends of the links of greater cross-section than the sides, and so provide for wear and tear, and at the same time give a greater resistance to deformation under strain."

Weldless Chains Stronger than Welded Chains

Some years ago Mr. Strathern invented the process of making weldless steel chains from cruciform bars by stamping or segmental rolling. A machine built in accordance with his design is now working successfully at Gartsherrie, near Coatbridge, and large quantities of chains are being produced regularly on this machine. Chains made by this process have the ends of the links materially thickened where the wear usually occurs, and the proof-load applied to these chains is approximately the same as the breaking load of a welded iron chain of the same size. The ultimate strength of these chains is approximately 100% greater than that of welded iron chains acceptable for British Admiralty Service. For example, a three-quarter-in. weldless steel chain, tested at Birmingham University, broke at 28 tons, whereas a welded iron chain of the same diameter would only be required to stand a breaking load, in accordance with the Admiralty scale, of 13½ tons. It is safer to lift 3 tons with a half-inch weldless chain than it would be to lift 1½ tons with one which is welded.

During the last few years weldless steel chains have been largely adopted for mining and general purposes. In many important collieries throughout the country they are being used exclusively for car couplings, cage bridles, and other chains.

Mr. Landless said that he had seen a weldless chain over a mile in length at work. It had been working for four years and had given great satisfaction.

Collapsible Air Ducts for Mine Fires

Gustav Ryba, Royal-Imperial Chief Mine Controller at Brüx, Bohemia, Austria, gives the following notes on the fighting of mine fires in the Zeitschrift des Zentral-Verbandes der Bergbau Betriebsleiter Oesterreichs:

The usual way of coping with a fire is by the use of props, boards and brattice cloth. But where the cross-section of the heading is too narrow to permit of the erection of such a side airway, air conduits can be used. These may be made of cloth, and can be folded up like Chinese lanterns as is shown in Fig. 1. They are easily carried from place to place. These cloth conduits are made and sold in Vienna. In order to prevent the collapse of the cloth cylinders with consequent obstruction of the air, they are stiffened by steel rings within.

Fig. 2 shows the use of such a temporary air duct placed in a vertical shaft. According to the data furnished by J. Jicinsky, a mine manager, 100 yards of horizontal air conduit can be laid in 15 minutes.

The ventilation may be obtained by a split from the main air current or from a small portable fan, driven by hand or water power.

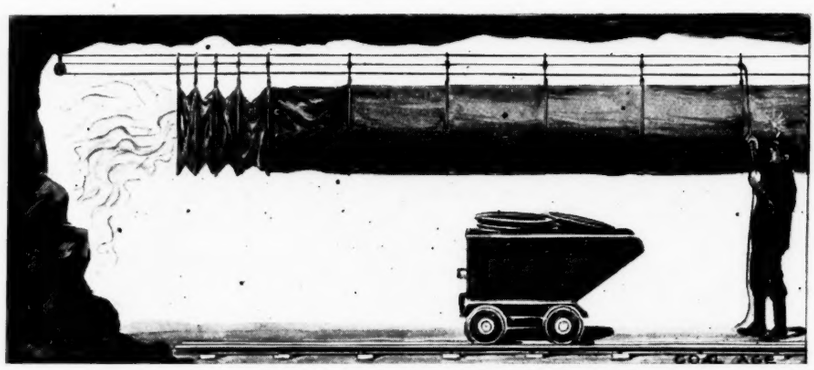


FIG. 1. AUSTRIAN DEVICE FOR APPROACHING FIRES

FIG. 2. VENTILATING BAG FOR USE IN SHAFTS

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This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

	PAGE
Foreword	565
Determination of Coal Thickness. R. Dawson Hall	566
Needless Waste in Grease and Oil. E. L. Cole	568
The Problem of Mine Timbering. R. B. Woodworth	570
European Wash House Practice	573
United Mine Workers' Convention	575
Fuse and Squibs	575
What's in a Name?..R. W. Raymond	577
American Institute of Mining Engineers	577
Cause of the Wyoming Explosion	577
Current Coal Literature:	
Ventilation in Sinking Shafts	579
Briquetting Machines	579
Grounding	579
Welded Chains	580
Collapsible Air Ducts for Mine Fires	580
Editorials:	
Electrical Supervision	581
The Minimum Wage	581
Dusty Gob Headings	582
Coal Liming	582
Discussion on "Sealing off Mine Fires"	583
Inquiries of General Interest	586
Examination Questions and Answers	587
Colliery Villages	588
Coal and Coke News	589
Coal Trade Reviews	593

COAL AGE

Electrical Supervision

The introduction of electrical machinery into mines has required from the personnel working therein, knowledge of an entirely new character. The result has been twofold. The mining companies have suffered from the incompetency of their men, and the men have suffered in varying degree from the lack of skill of their co-employees.

On only one ground, that of safety, is it permissible, within Constitutional restrictions, to urge the examination and licensing of any body of craftsmen. Nevertheless, as such a change might cause some additional expense to the coal companies, it would be well to supplement the consideration of safety by drawing attention to the advantage of having men of known efficiency. A shiftless way of operating, which burns out armatures, causes short circuits in coils, permits leakages along leads, leaves machinery where it is subject to moisture and corrosion, allows bonds and cross bonds to become loose, and imposes unnecessary resistance at joints, obviously is not profitable. The coal company is bound to pay the wage which will justify the acceptance of employment by competent men if it would secure economical work, and it will not cost any more to engage a competent and licensed man than one who is competent and yet unlicensed.

The licensing of the electrician should be by a special electrical inspector. The examination should cover many of the dangerous features in electrical wiring, and the operation of electrical mining apparatus. Every mine should have an electrician capable of installing simple equipment, or of supervising its installation. In small mines working 150 men the foreman could serve as electrician if duly qualified and licensed, but in larger mines, a separate man should be required. Perhaps, however, consideration might make the electric output the basis for division. There are logical considerations for either decision.

In England, the special rules, adopted in 1905 under the authorization conferred on the Home Office in the Coal Mines Regulation Act of 1887, require a competent person to be on duty above ground and another below when electricity of more than 200-hp. is being transmitted. The law is indefinite as to the meaning of competency and is made harder to understand by the further requirement that "every person appointed to work any electrical apparatus shall have been instructed in his duty and be competent for the work he is set to do." A degree of competency is therefore required which in any particular case would be hard to determine.

It may be added that any person appointed as superintending electrician should have opportunity at least four days in the week to superintend the condition of the wiring, bonding and machines, and to direct the men under his charge in the performance of their duties. If reasonably free from hampering non-supervising duties, such an electrician should be able to superintend both above and below ground.

The Minimum Wage

The situation in England is extremely interesting, the more that it shows the future trend of American unionism. If the American laboring man tends in himself to evolve on different lines from his English cousins, the force of example is almost sure to interfere with the simplicity of his evolution.

Say what we will, the American workman has in the past been willing to labor, on the whole, an eight- or ten-hour shift for an eight or ten hours' pay. But present signs indicate that he is not as willing to do it now as formerly. Ten or fifteen years ago a man was hired to help, much as on a farm, at every job that appeared.

But with schedules of wages immutably fixed by unions, a man will now do noth-

ing for which a higher rate is paid unless his pay is raised accordingly. To do so would be scabbing. Nor will the workman of today do work lower in the scale than that for which he was hired. This, he feels, would be socially lowering and besides might result in a reduction of his wages. And neither will he do another man's work, although it is paid for at a rate identical with his own. That might cause his fellow workman to be laid off and would be resented. All the union permits him to do is the work for which he is specifically employed. Otherwise he must remain idle.

It is to be regretted that we have about the mines so many different jobs with fractional differences of pay; this condition results in the establishment of so many castes, that every man awaits, albeit with no anxiety, for the approach of that particular piece of work for which he was specifically engaged. Of course, this incapacitating condition has gone further in England, still further in France, and further yet in India. But we are traveling along the same road fast enough to arouse concern, and, to prove this contention, all we need to do is to recall how business was conducted only ten years ago; how every man ran forward to give a lift, hustled the rock out of the mine cars and snow out of the gondolas for the morning start.

It is different now; the men inside wait for cars and earn a lessened wage because the employee without warms his hands while certain men hired and labelled drivers, rockmen or snowmen, have to do their work begrudgingly alone. The spirit of emulation, the spirit of "all together, boys," has gone with the passing years and a new condition faces us.

The deliberate and intentional reduction of the workman's activity has as yet scarcely invaded this country, but, as we show a great aptitude for embracing alien faults, we may anticipate its arrival. The English workman lays less brick and digs less coal, not because he is a less competent fellow. He is as efficient, physically and mentally, as the average employee in America, reckoning the native and foreign admixtures. He digs less because he wills to dig less. He lays less brick because he wishes to lay no more. The will and not the ability is lacking. He has shortened the working hours by union regulation and by act of Parliament. We wonder he has not still further shortened them—so little has he concluded to do.

The minimum wage is planned as a provision whereby the man who does not earn enough to cover the cost of necessities, may be presented with a living wage at the expense of the coal owner. There are some old men, whom this new plan will inevitably force out of the mines; also, many incompetents will be weeded out, while the lazy will have to travel the road of the weak. And so perhaps, on the whole, the operator will not suffer. But it will be a severe burden on the resources of the English nation to support the old and incompetent whose capacities are perhaps only half that of normal men in their prime, and who, by this ill-considered provision, if extended to other forms of labor, must be thrown entirely out of all work.

The minimum wage will leave the operator just about *in statu quo* and the miner just a little worse off than he was before, for he will be thrust out of his work in his old age. The principle is bad. We may overlook the disputes it will occasion, the bitter enmities and feeling of desperation which will arise, when men are discharged for the incapabilities of age. We can hear them repine that it is "a sin to grow old."

But apart from all this, the introduction of the minimum wage is a sign that the economic reasoning of the laboring classes of England is essentially wrong. We have never been absolutely sure that labor was not the source of all wealth, seeing that capital is but stored labor, and land but the body on which labor operates. But if, as the workers significantly claim, labor is wealth, then where is wealth without labor? Will the country of England, and the miners of England, an important part thereof, accumulate wealth by rest? The "idle rich" constitute a great international problem, but still greater is the problem of the "idle poor," for if no one will work, there can be no wealth.

We can see some sense in a raise in wages. In the readjustment, the capitalist may write off a little of his profits and labor thus secure a larger proportion. Moreover, if, of all trades, the workers in one industry get the earlier raise, then those workers will continue to score by greater purchasing power until the index of staples takes a new rise. But what gain is there in decreased production? It does not affect the distribution of wealth, but merely its total amount. There can be no gain to labor from a decrease of production. The bee might as well say, "I will be a wasp and store no honey," as the worker say, "By working less, I shall live better."

It is needless to say there is no advantage in overworking, and some Americans, many miners among them, are working too hard. But there is no greater truth than this: When men conserve their labor to a degree which does not aid in preserving either life or effectiveness, they do not conserve, but rather destroy the wealth which that labor represents.

Dusty Gob Headings

According to Mr. Mavor, the percentage of coal dust on floor, sides and roof of a rough heading amounted to 70, 24 and 6% respectively of the whole dust found. Where the sides of a roadway are gobbed, the accumulated dust on the sides may be a large percentage of all the dust present. The Briceville explosion may well have been made more severe by the dust on the extended gob-walls at the sides of the butt-headings.

It may be said, however, that the advocates of schistification favor a rough heading, along the sides of which large masses of stone dust may be conveniently distributed to permeate the ventilating current at the first disturbance of the air or vibration of the measures.

Coal Liming

The English gas plant owners have shown a revived interest in coal liming. The process consists in mixing ordinary limestone finely powdered, with the coal as charged into ovens or retorts. The advantages claimed for it and which have actually been obtained at the Cheltenham Gas Works, England, are: Reduction of sulphur compounds in gas, increase of gas yield and illuminating power, and the production of suitable metallurgical coke from high sulphur coals, by reason of the sulphur combining with calcium, the body thus formed in the coke, calcium sulphide, being a compound of sulphur more or less inert when used in the process of reducing iron from its ores.

Discussion by Readers

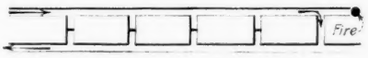
Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Sealing off a Mine Fire

(*Continued from Feb. 3*)

Letter No. 18—As to the proper method to follow in stopping off a fire that is located at the face of a pair of entries, I wish to say that from my experience, (and I have been to a great many fires) I would always put my first stopping in the intake side as close to the fire as it is possible to get.

I would cut the air off from the fire even though I had to put up a temporary stopping and the permanent one later on. I should try to prevent an explosive mixture forming. I have never known a case where I would place the first stopping in the return. Other men may differ from me, but this is my opinion. I am



attaching hereto a little sketch, showing where I would put the first stopping, if it were possible to get so close to the fire.

RICHARD NEWSAM,
Pres., Illinois State Mining Board.
Peoria, Ill.

Letter No. 19—I have had some personal experiences in dealing with mine fires, and have had to play "tip and run" in at least one of these. While recognizing the fact that it is often impossible to approach the return side of a fire that has gained considerable headway, generally speaking, I should certainly make every possible endeavor and close the return airways first.

By closing the return side first, when it is possible to do so, I confine all the products of combustion to the area of the fire; and these assist greatly in deadening and finally in extinguishing it. These confined gases expanded by the heat of the fire push back the fresh air that would enter the intake end.

If, on the other hand, that end is sealed first, there is the greatest likelihood that sufficient fresh air will be pent up inside or behind the stopping to keep the fire alive and to make the gases generated highly explosive. My advice is, whenever possible, close the return end first and make it tight as wax. I would like to go more into detail in the important discussion you have started, and may do so a little later; but time will not permit me to do this at present.

JAMES ASHWORTH.
Vancouver, B. C., Canada.

Letter 20—It never occurred to me that there was any other way of sealing off a mine fire than by placing the first stopping in the intake entry, just inside a crosscut which could be quickly opened to allow the air to short-circuit, and then to build the second stopping in the return. However, there are always two sides to a question and this one was submitted to three well trained, experienced coal-mine superintendents in the Illinois field, and their answers published herewith indicate how mining men differ on problems supposedly simple and generally assumed to have been solved in the early days of mining.

This solution is from a superintendent working in a field subject to gob fires:

If I had a fire to deal with in the face of an entry, I would undoubtedly close the return-air side first, especially if the coal was giving off marsh gas, for the reason that when you close the return side of the entry, the gases given off by the fire would drive back the fresh air on the intake and eliminate the possibility of sealing up a large amount of fresh air with the fire.

The following is from a man in active charge of gaseous mines, who has had wide experience in fighting mine fires:

I would build the first stopping on the intake, in order to stop the air current from blowing on the fire, as quickly as possible. I do not think the smoke would be as bad to work in on the return, with the first stopping on the intake, as it would be if we attempted to build it on the return first.

This answer is from an experienced superintendent, who has had a number of fires to subdue:

My opinion in this case, confining myself to the simple case of a mine fire, and assuming, of course, that there is no gas to contend with, would be to put the first stopping in the intake, which could be done without the workmen being greatly handicapped by smoke. When that first stopping, blocking off the air, was built, the smoke on the return entry would be reduced, and the men could erect the return-side stopping without difficulty.

The assumption that there is no gas is wrong, since any fire may generate enough carbon monoxide or other explosive gases to make an explosion imminent, and the only safe way is to assume gas to be present and act accordingly. An analysis of the case presents the following:

FAN EXHAUSTING

Stopping placed on intake—Would involve sealing up some fresh air in that entry, and fan would draw gases and smoke down the return and into the workings, making more difficult and dangerous the work of placing the second stopping.

Stopping placed on return—Less fresh air would be sealed up on account of the gases and smoke backing up and filling the intake. This plan would prevent the dissemination of smoke and gas through the mine.

FAN BLOWING

First stopping placed in intake—Some air sealed up; this method relieves intake of ventilating pressure and allows gases to issue from coal, possibly creating a dangerous condition.

First stopping placed on outlet—Less air would be sealed up with the fire on account of smoke and gases filling the entry while the stopping is being built and smoke backs up into the intake; also when the second stopping is built, the minimum amount of air would be sealed up in the fire zone.

The result of this hurried analysis seems to prove that the fire stopping should be built in the outlet, regardless of the plus or minus water gage; first, because it permits sealing up the entry with the least amount of air; second, it prevents gas and smoke filling up other parts of the mine; third, it does not involve danger of drawing gas or explosive mixtures over the fire.

It does appear, however, that these arguments are more or less theoretical and the conclusions far-fetched. About the only way a man can get to a mine fire (without a helmet) is by following the air; when he gets as close to the fire as the heat or smoke will permit, the nearest crosscut is opened, the air short-circuited and the two stoppings (generally a curtain first) should be built practically simultaneously, if the force of men is large enough. The first one to be finished, of course, will be the one easiest to get in place on account of height, roof, floor, etc.

Probably the reason the intake stopping is generally erected first is because the men can work in better air, and for the reason that material and tools are carried in along the intake airway, and it is natural to drop them at the last crosscut and build the stopping there rather than drag them through and work in the smoke. These are the actual conditions facing the men doing the work, and since there are no positive reasons for doing the job differently, you generally find the

first stopping in the intake, especially when working on a serious and dangerous fire.

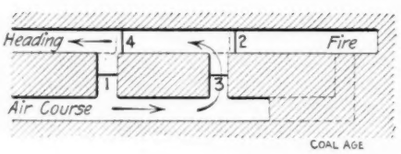
I am sure that the amount of air sealed up in building the stoppings would not make an appreciable difference in the life of the fire. The oxygen behind the stopping that aids the combustion is either from disintegration of H^2O, or is sucked through the stoppings by the contracting gases on account of the volume being reduced by cooling. I think the best thing to do is to get the stoppings in place as fast as conditions permit (regardless of which one is first) and then make them *tight*.

JOHN A. GARCIA,
Mining Engineer.

Chicago, Ill.

Letter No. 21—In answer to the question, "Which is better, in sealing off a mine-fire that has gotten beyond control; (1) to place the first stopping on the return side of the fire, or (2) build the first wall on the intake side of the trouble?" will say that I assume the fire is near the face of a heading and has assumed such proportions as to make it impossible for men to reach it, and for this reason it has been determined to seal it off. The problem is what is the best way to go about doing this.

The accompanying sketch shows the assumed location of the fire in a heading which is somewhat in advance of the air.



SHOWING LOCATION OF STOPPINGS AND DIRECTION OF AIR CURRENT

The arrows indicate the direction of the ventilating current. If I could do so, even by building a temporary brattice, as shown by the dotted line, I would build the first stopping or brattice at 2. This should temporarily be constructed of wood so that it may be put into place with great rapidity, and if thought desirable, a stone or other more permanent brattice could be built outside of the wooden one afterward. This would effectually cut out any possibility of the fire spreading, and after the brattice 2 had been built, or in fact during its construction, the air-course could be extended as indicated by the dotted lines. This, if necessary, would make it possible, after making a small opening in brattice 2, to reach the fire with water-hose or enable it to be attacked by other means.

In case the brattice 2 could not be built at the point indicated, I would build it at point 3, and, as the air-course was being closed up at this point, the brattice could be removed, after which brattice 4 could be built with the aid of the brattice or curtain shown by dotted line. After brattices 3 and 4 were put in, the air-course could be extended as shown by dotted line, and the fire attacked as indicated above.

As to which one of the brattices, 3 or 4, should be built first, the practicable way would be to follow the plan indicated above; that is, build brattice 3 first, for the reason that the air-current would keep away any smoke to interfere with its construction, and after finishing it, brattice 4 could be built with the aid of the brattice or curtain shown by dotted line. If it would help and was necessary, a part of the ventilating current could be allowed to pass through brattice 3 by making a small opening in it.

Of course, in the case of almost any mine-fire the mode of procedure is much modified by conditions and these conditions might cause a change from the plans I have outlined above.

I have not taken into consideration the presence of explosive gas as that point is not raised in the question. This point, however, might cut a considerable figure and call for special consideration and precautions.

ERSKINE RAMSAY,
VICE-PRESIDENT.

Pratt Consolidated Coal Co., Birmingham, Ala.

Letter No. 22—In my judgment, the first stopping should be placed on the intake airway, for, under the circumstances, it is essential that it be built as quickly as possible and it is evident that more rapid work can be done in the clear air of the intake than in the smoke and fumes of the return; but, even if by the use of oxygen apparatus or other device it could be constructed as readily and quickly in the return as in the intake, I would still select the latter as the right place for the first stopping.

In the case before us, two things should be kept in view; (1) the most effective means to keep the fire from gaining and to subdue it, must be applied as expeditiously as possible, and (2) the safety of the men doing the work must have the most careful consideration. The last is of paramount importance.

The fire, as stated in the question, is beyond control by ordinary means. Therefore, if the first stopping is started in the return, it is apparent that the fire, with a practically undiminished air supply reaching it by way of the intake while the work of building the stopping is going on, will continue to gain materially and the consequent increased intensity of heat, the greater volume of poisonous fumes in which the men must labor, the increased danger from roof falls and other difficult conditions, will make fast effective work almost impossible, and may even force the workmen to quit the job before it can be finished.

The conclusion that the erection of the first stopping in the return is a protection against a possible explosion is not sustained by the facts. An explosion of a mixture of combustible gases and air, or coal dust and air, may occur with explosive results on the intake side of the fire, where air is present in sufficient amount and purity to support combustion. Explosions have occurred in just this way, and that danger is not averted or reduced materially by starting the first stopping in the return airway.

If the first stopping is started in the intake, the earliest possible check of an excessive and highly dangerous draft along the floor in the intake toward the fire is provided. As work on the stopping progresses, the excess air supply through the intake is steadily reduced, resulting in a material increase in CO_2 in the return, and therefore greatly lessening the possibility of an explosion in that region. As the stopping nears completion and the air supply becomes more attenuated, the products of combustion will spread further out from the fire along the intake and the additional short time needed to close the stopping may be considered a critical period, but undoubtedly this period of danger of a possible explosion and the danger itself are much less than under the attempt to place the first stopping in the return.

It may be held that the inclosing of fairly pure air between the completed stopping and the fire still involves the danger of explosion. This contingency appears to be remote. The inclosed air supply is of fixed and limited amount, and of a rather stationary character; it cannot advance freely toward the fire and what little advance there may be is speedily checked by the rapid rise in its temperature. But, supposing that under such unfavorable conditions and in the presence of a considerable amount of CO_2 and other noncombustible gases, an explosive mixture could be produced near the stopping, there is still no imminent danger because the means of ignition are absent and the mixture cannot get to the fire without losing its explosibility.

After the completion of the first stopping in the intake the possibility of an explosion on the return is practically eliminated. It is true that the return for a considerable distance outward from the fire is filled with hot gaseous matter, but the bulk of it is unfit to support combustion, and what combustible gases may be present near the fire, cannot be ignited because of lack of sufficient air.

Naturally, after the closing of the intake stopping, an air movement in the return toward the fire will set in, but the air, now befouled more or less by CO_2 and otherwise vitiated, can only make comparatively slow progress in that direction because its advance is steadily opposed by the resistance of the stretch

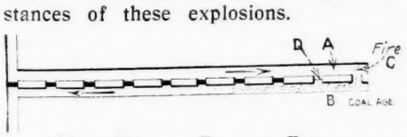
of heated gases, intervening between it and the fire, a resistance that can only be overcome by a gradual reduction in their temperature. In the meantime, the men building the stopping in the return can labor under more favorable conditions, permitting faster and better work.

I have kept the matter of the possibility of an explosion in connection with a mine fire in the foreground because it appears that the consideration of this contingency is the underlying cause for the difference of opinion regarding the selection of the right place for the first stopping. But while the matter deserves careful attention, it should be remembered that experience has shown that the danger to life and property from the direct action and smoke of a mine fire that is getting beyond control by ordinary means is vastly greater and certainly more immediate than the danger from the more remote possibility of an explosion. The exigency of the case demands that the greater danger receive first consideration; therefore, its main cause, the strong draft playing on the fire through the intake, should be removed at the earliest possible moment. In my judgment, this can be accomplished in the most effective manner and in the shortest space of time and without increased danger from any other source by erecting the first stopping in the intake.

JOHN VERNER.

Chariton, Iowa.

Letter No. 23—In reference to the treatment of a mine fire, many so-called authorities recommend sealing off the return first. I am sorry to say some textbooks advocate a like method. One I remember says in addition: "Many valuable lives have been lost and many disastrous explosions have occurred through sealing up the intake first." However, they do not give instances of these explosions.



MINE FIRE AT FACE OF ENTRY

The fact is, I have put out several fires, and have always been successful with them. My plan is to carry the air up as *close* to the fire as possible, which gives my men good air to work in. When I find it is impossible to extinguish the fire, I seal up the intake in *good* air to the last inch, then get a hole through the first crosscut behind me and build my last wall, forcing the warm fumes to the top by a temporary partition of cloth or board, which I arrange to have handy.

Just imagine a fire at the face of a pair of entries giving off CH_4, the gas burning in the coal at point *C* (shown in the sketch). Assume that said entries contain a pair of concrete-stopped crosscuts 2000 ft. from the main entries. Do you suppose a fireboss, foreman, or underground manager would lead his men up the return to *B* in all these fumes? Would he not rather go to *A* in good air and seal the intake there; then have other men open the crosscut *D*, and seal up *B*? Furthermore, how could an explosion occur at *A* when the gas was already ignited?

After putting out the flames by smothering, I would open up the return to see personally whether the fire was out before I would turn on the fresh air.

JOSEPH VIRGIN.

Plymouth, W. Va.

Mr. Garcia Replies to Mr. Norris

Please enter my protest against the assumptions and recommendations in letter No. 16 on mine fires by R. V. Norris, published in your issue of Feb. 3, 1912. Mr. Norris advises that we build the first stopping in the intake entry in order to reduce the amount of gas given off by the fire, etc., and I thoroughly agree with him as to location of first stopping, but strenuously object to the statement following, i.e., "this procedure would be reversed in case the workings gave off a large amount of explosive gas."

There are always explosive gases given off by mine fires; at least there are gases, the composition of which we do not know at the moment, and the only safe procedure is to assume them explosive and direct the work accordingly. Men who "assume there is no gas" belong in the category of those who "didn't know it was loaded" and should be kept on top whenever there is a fire in a mine and help needed below.

Mr. Norris also states that it would be a good plan to reverse the air after placing the first stopping in the intake in order that the second stopping might be built in fresh air. What a fatal mistake that would be! Suppose we were at work building a stopping in the intake near an open crosscut, and the fan was blowing air; what would happen if someone reversed the fan so it would exhaust? All the smoke and gas in the return would at once be pulled out on us, and the suction would draw the thick smoke and heavy gases and possibly the fire through the crosscut and force a hasty retreat and perhaps cause an explosion.

Reversing a fan is a dangerous and questionable proceeding at best, and under circumstances such as outlined above, would not only lose the fight, but endanger the lives of the men, unless it is assumed that the men all leave the mine when the air is reversed, and then what happens to the fire while all this is going on? Reminds one of the fellow hanging to the bridge above the rapids, and who, growing tired, said to a companion dangling at his heels, "Wait a bit, till I spit on my hands."

J. A. GARCIA,
MINING ENGINEER.

Chicago, Ill.

[In our issue next week, we will publish letters from Carl Scholz, president of the Consolidated Indiana Coal Co.; J. T. Beard, associate editor of COAL AGE, *and other well known engineers.—*EDITOR.]

Textbooks at Examinations

I was interested in the letter by Iago, appearing in COAL AGE of Jan. 20, and wish to respond to his request for opinions as to the use of textbooks at fireboss and mine-foreman examinations. I feel that I am entitled to speak on this subject, as I shall never forget the nights that I struggled with a problem in square root or a formula in ventilation, when my physical weariness was positively painful, and it is a well known fact that at a time like this the brain is in no condition for such strenuous work as technical mine problems. Although I believe a certain amount of technical proficiency is necessary in a foreman or fireboss, yet there are good men who have given up the struggle for a certificate because of the conditions under which they have had to prepare for the usual examinations.

While, of course, it is absolutely necessary that a mine official should have a general understanding of the principles of mining, yet many of the rules and formulas which some of us have wrestled with for hours are of less actual value to us in our everyday work than we ourselves would probably care to admit. After all, the real test of a mine foreman or fireboss is his judgment as a practical man, rather than his ability to memorize rules and formulas, and I know of a number of men, of more than usual ability, who have failed under this latter superficial test. In fact, I have in mind at this moment, two mine foremen, one in Ohio and one in West Virginia, who were the best mine officials I ever knew, and yet could not memorize any particular rule of mathematics or any particular clause of the mine law.

It seems to me that one of the chief duties of an examination board should be to draw out the character and personality of the applicant, ascertaining as far as possible his knowledge as to the general operation of mines, and his views regarding the common dangers, safety measures, appliances and like matters.

In my opinion the oral examination of mine foremen and firebosses should play a much larger part than it does at present. Given 15 or 20 min. conversation with a man, a board of examiners should be able to tell whether or not he is qualified to manage a mine, just as any other man of experience could determine this fact under like circumstances.

Marianna, Penn. SIM REYNOLDS.

Inquiries of General Interest

All Questions Must be Accompanied by Name and Address—Not for Publication

Thawing a Frozen Pipe Line by Electricity

A neighbor has 600 ft. of a 2-inch iron pipe, used as a supply line, frozen. He has ample electric power at command. Is it possible to use this power to thaw out the pipe line and what arrangement is necessary for this purpose?

C. B.

Shaw, W. Va.

Electric power has frequently been used with great success and economy in thawing out a frozen pipe line. Success, however, in any particular case, will depend on at least two essential conditions; namely, (1) a sufficient electric power transformed into a current of high amperage and relatively low voltage, depending on the size, length and conductivity of the pipe, which can only be definitely determined by experiment; (2) a sufficient insulation of the pipe line throughout the length of the frozen section to confine the electric current to the pipe without undue loss of power.

The principle involved is that if a current of sufficient strength is passed through the pipe the resistance developed may be such that the pipe will heat and the ice be melted. The resistance and consequent heating of the pipe will depend on its electrical conductivity, for any given current. The metal cross-section and its relative conductivity and insulation, in a way, determine the necessary amperage of the current, while the length of the frozen section suggests the voltage required. These data must be ascertained by an electrician, on the ground. A special transformer is generally required as the ordinary type will hardly be capable of giving the required voltage and amperage. This must be ordered to suit the conditions, which should be submitted in detail to an electrical supply company.

Authority to Act as Mine Foreman

Suppose, at a mine employing both a mine foreman and assistant mine foreman, the assistant foreman leaves. The mine foreman at once appoints one of his regularly employed firebosses to take the place of assistant mine foreman.

But, suppose the mine foreman suddenly resigns his position as foreman and goes away, whom could he leave in charge of the mine until another mine foreman can be secured to take his place?

SUBSCRIBER.

Newcomer, Penn.

The bituminous mine law (1911) of Pennsylvania, Art. 24, Sec. 9, makes it "unlawful for any operator, manager, or superintendent to employ as mine foreman in any mine, or as assistant mine foreman in any gaseous mine" any person not holding the proper certificate of qualification or service. The same law, however (Art. 4, Sec. 1), permits the assistant foreman, in the temporary absence of the foreman, to perform all the duties of the latter.

No provision is made in the law, as far as we know, for a fireboss to assume the duties of assistant foreman in a gaseous mine. He must hold a certificate of qualification for such position before he can be legally appointed to fill the place. The requirements for the two positions, however, are quite similar; the candidate for assistant foreman in a gaseous mine being required to obtain 70% in examination, while the candidate for fireboss need secure only 65%. Each must pass an oral examination in explosive gas, in addition to the usual written examination.

No examination seems to be required, in the law, for the position of assistant foreman at a non-gaseous mine.

Pumping At a Slope Mine

We have a slope dipping about 11% for 2400 ft. At the slope bottom we have a borehole that is 320 ft. deep. About 1000 ft. from the top of the slope we have another borehole that is about 208 ft. deep. The drainage above the upper hole is about 400 gal. per min., while that between the upper and lower holes is practically 200 gal. per min.

Before arranging the system of pumping in this slope we would like to have your opinion as to what would be the most economical system to adopt—to establish a pumping station at each borehole; or to run all the water to the lower station and have but one pump, which would save the expense of a pump runner.

BOREHOLE.

Dunlo, Penn.

Two pumping stations would practically double the cost for attendance, supplies and repairs, while it would save the power and consequently the fuel required to raise 400 gal. of water per min. a vertical height of 320 — 208 = 112 ft. The saving in fuel would amount to

$$\frac{400 \times 112}{600 \times 320} \times 100 = 23.3\%$$

According to figures based on a careful estimate of the cost of pumping, at the Short Mountain Colliery of the Lykens Valley Coal Co., made by R. V. Norris, chief engineer for the Pennsylvania R.R. coal companies, during the great strike of 1902, when it was possible to obtain reliable data in this regard owing to the complete cessation of other mining operations, the cost of fuel, reckoned at 50c. per ton, may be taken as $0.0188 per 1000 gal. of water, lifted a vertical height of 1000 ft.

In the present case, the quantity of water that must be handled each 24 hours is

$$600 \times 60 \times 24 = 864{,}000 \text{ gal.}$$

With a single pumping station at the foot of the slope, this water must be lifted a vertical height of 320 ft., at a cost for fuel of

$$0.0188 \times 864 \times 0.32 = \text{say } \$5.20 \text{ a day.}$$

If a pumping station is located at the upper borehole it would effect a saving in fuel of about $0.233 \times 5.20 = \text{say } \$1.21$ a day. It would, however, require another pump runner and this, with the additional cost for supplies and repairs, would increase the expense for pumping about $2 a day. As a result of maintaining two pumping stations, therefore there would be a net loss of about 80c. per day.

[In a second letter, our correspondent suggests placing a pump at the lower sump and pumping all the water from this station. He asks if a pipe be laid to conduct the water of the upper basin to the pump, and a valve be provided at the pump to shut off the flow of water from above while pumping from the lower sump, could not the head due to the vertical height of the upper basin above the pump be made available, so that when the pump is handling the water of the upper basin it would only be working under an effective head corresponding to the vertical height of the point of discharge above the upper basin. We answer, Yes, by a proper arrangement of the pipes and two valves, one at the foot of the slope pipe and the other in the suction pipe below the entrance of the slope pipe.—EDITOR.]

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Interesting Questions for Beginners

Enlarging An Airway

Ques.—An air course is 3x3 ft. and 1050 ft. long; and it is decided to enlarge its section and make it 6x6 ft., to furnish more air for the mine. The work of enlarging the area was started at both ends of the airway and continued till but 50 ft. remained to be completed. It was then stopped. What, if any, effect will be produced in the circulation of air in this airway?

Ans.—The airway was originally 3x3 ft., 1050 ft. long; it is now divided into three sections, which are continuous or tandem to each other. Two of these sections are 6x6 ft., 500 ft. long; and the remaining or middle section is 3x3 ft., 50 ft. long. The simplest and quickest way to ascertain the effect of this enlargement on the circulation of air is to calculate the value of the potential, first, for the original airway, and then for each of the three sections into which this airway is divided. The first and last sections being alike, however, it is only necessary to calculate the potential for one of them. Thus,

Potential Values of Airways

$$\left(X^3 = \frac{a^3}{lo}\right)$$

Airway, 3′x3′, 1050 ft. long,

$$X_0^3 = \frac{9^3}{1050 \times 12} = 0.0578$$

Two sections, each, 6′x6′, 500 ft. long,

$$X_1^3 = \frac{36^3}{500 \times 24} = 3.888$$

One section, 3′x3′, 50 ft. long,

$$X_2^3 = \frac{9^3}{50 \times 12} = 1.215$$

If the power on the air remains unchanged; in other words, for a *constant power*, the quantity ratio is

$$\frac{q_2}{q_1} = \sqrt[3]{\frac{X_1^3 X_2^3}{X_0^3 (2X_2^3 + X_1^3)}}$$

$$= \sqrt[3]{\frac{3.888 \times 1.215}{0.0578 \times 6.318}} = 2.347$$

On the other hand, if the ventilating pressure remains unchanged; in other words, for a *constant pressure*, the quantity ratio is

$$\frac{q_2}{q_1} = \sqrt{\frac{3.888 \times 1.215}{0.0578 \times 6.318}} = 3.596$$

That is to say, if a certain power will circulate 10,000 cu.ft. of air in a 3x3-ft. airway, 1050 ft. long, the same power will circulate 23,470 cu.ft. after the airway has been enlarged to 6x6 ft. for a distance of 500 ft. from each end, leaving a section 50 ft. long, in the middle of the airway, the same size as before; namely, 3x3 ft.

Or, if a certain ventilating pressure or water gage circulates 10,000 cu.ft. in the original airway, the same *pressure* will circulate 35,960 cu.ft. after said enlargement is made.

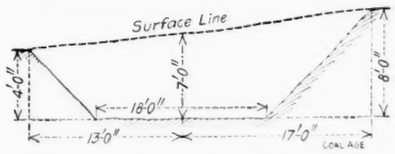
[The above question is practical and one that every mine engineer and ambitious mine foreman should be able to work out at leisure, but it is too difficult, and has not been sufficiently explained in the mining textbooks in common use to warrant its being asked in a mine foreman's examination—Editor.]

Surveying, Calculating End Areas, Excavation or Fill

Ques.—Give a practical and simple formula for the exact calculation of end areas, in excavation work, where the center and side cuts and the width of the roadbed are given, and the side slopes are 1 : 1, or at an angle of 45 deg.

Ans.—The following rule is used frequently in railroad-surveying practice:

Rule—Multiply the sum of the distances out, or the total distance between slope stakes, by one-half the center cut (or fill); again, multiply the sum of the side cuts (or fills) by one-fourth the width of the roadbed; add these products together, and their sum is the end area required.



Cross-section of Excavation

For example, Fig. 1 is a diagrammatic sketch showing the cross-section of a cut made for a siding, at a coal mine. The center cut is 7 ft. and the two side cuts 4 ft. and 8 ft., respectively; the roadbed is 18 ft. wide. The area of this section is found readily, as follows:

$$(13 + 17) \times \frac{7}{2} = 105$$

$$(4 + 8) \times \frac{18}{4} = 54$$

Total area 159 *sq.ft.*

Indiana Questions

Hoisting Engineers' Examination

Ques.—(a) Where should the brickwork close in on a boiler? Give reason. (b) What is a blister on a boiler and how is it produced?

Ans.—(a) The brickwork must meet the boiler below the low-water line, so as not to expose the plates to the fire above the water level in the boiler, which would result in overheating, burning and blistering the iron.

(b) A blister, in boiler practice, is a small nub, or a number of them together, formed on the surface of a boiler plate exposed to the fire and showing that the iron has been burned and its strength impaired. The blister is the result of the local overheating and burning of the iron, owing to a strong concentration of heat at one point, because crustation or other impediment has prevented contact of the water with the plates.

Ques.—(a) Is a gage-cock or a water-glass to be preferred, and why? (b) If the glass water gage of a boiler in your charge should be broken when the boiler is under steam, what would you do?

Ans.—(a) The gage-cock is not only more reliable as furnishing positive evidence of the true water level in a boiler, but it is less liable to accident.

(b) Close the stop-cock of the gage below the broken glass first, and after that close the upper cock. To close these cocks while steam and hot water are issuing in scalding jets and sprays is practically impossible, unless the fireman has had the foresight to provide himself with a long-handled tool by which these cocks can be turned at a safe distance, or unless he can secure a waterproof covering, under which he can approach and close the cocks. If the upper cock is closed first the steam pressure in the boiler will throw the water out in a scalding stream.

Ques.—A boiler to be run under a steam pressure of 100 lb. per sq.in. should be tested to what hydrostatic pressure to insure safety?

Ans.—The regulations in different cities and states with respect to boiler inspection require a hydrostatic pressure varying from 35% to 50% in excess of the desired working pressure, for boilers to be operated above, say 25-lb. pressure. A boiler to be run at a gage pressure of 100 lb. may be tested properly to 140 or 150 lb. hydrostatic.

Sociological Department

For the Betterment of Living Conditions in Mining Communities

Colliery Villages

By F. A. Boag

The Garden City Association of Great Britain has made the suggestion for village planning, embodied in the second design accompanying this article. While not an advocate of the spending of money in elaborate surveys of circular and parabolic curves, it seems to me that the idea has a real value. In the second plan, there are as many houses, namely 75 as in the first. There is less length of road to maintain by 425 ft. and a far more desirable appearance is presented. With a trifling change in the plans the houses might be converted into detached cottages, thus reducing the fire risk and promoting privacy.

Street Curvature

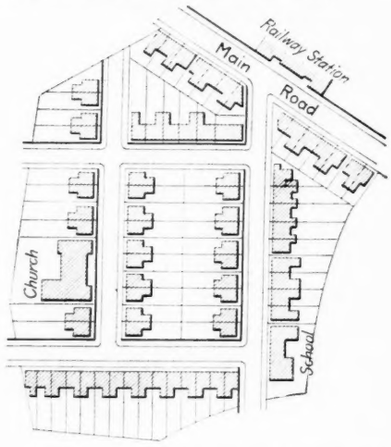
The severe straight lines by which we lay out our colliery villages makes them undesirable. These lines have been rendered necessary largely by the inefficiency of our methods of sanitation. It is evident that in the Garden City plan, some provision has been made for the care of fecal wastes, or otherwise the restriction of the back yards would be inexpedient, though with a little more land available this sewerage would not be absolutely necessary.

In the anthracite regions some of the villages have sprung up along crooked township roads and their appearance is far more inviting than are the stiff rows in those more pretentious villages where the intention is apparently to make a transplanted fac-simile of a city block.

As I have said, I would not advocate elaborate staking, but I would curve the streets to accord approximately with a rough survey previously made. Thus good grades could be obtained, trees of more than usual beauty could be preserved and the town would look more like a village and less like a slum. In many cases such grouping would enable houses already in existence to be left in position and large rocks would not have to be blasted and removed. Not infrequently such rocky masses might even be used to enhance the appearance of the village. There has been hitherto an expensive desire to fit the sites to the plan rather than the plan to the site with resultant loss of beauty, money, comfort and rapidity of construction.

Social Centers

Our mining engineers pay a fetish worship to the straight line, giving us long streets ending in vistas of smoky coke ovens, washer discharges, tumbling prop piles and unsightly rock dumps. If the surrounding country is undesirable, the village should be built so as to shut out the undesirable views; if beautiful it should be planned to utilize all the beautiful features. Centers should be established so that a few desirable tenants can together create a little world of their own, where their efforts in promoting beauty may not be marred by slovenly beer-guzzling neighbors who have no sense of the fit in rural life.



A Rectilinear Plot of a Colliery Village

As Replotted by Garden City Association

A center park with tennis lawn or croquet ground could form a nucleus round which could be ranged the store, the company offices, the hospital, the churches, amusement hall and doctor's office. The foreman, clerks, storekeepers, time keepers, village parson, doctor and school teacher could have houses facing on such another center and their efforts at aesthetic gardening and tree planting would probably result in the duplication of their efforts elsewhere. In this way, children of like tastes would have a chance to play together in the gardens in front, having no temptations to stray on to the road and the railroad.

Curvature Often Cheaper Than Straight Lines

One ill kept house often spoils a whole row and it is not right that any man's effort at decency should be spoiled by his neighbor's proneness to disorder.

The attempt to give a lively appearance to a town by a mixing of houses of different plan and color fails to give the excellence of appearance which naturally results from an irregularity of plan. Of course some straight streets may be necessary for through travel and the topography may favor such rectilineal alignment but more often careful planning will receive its award in making grades and cost of building less than they would otherwise be. On a plot of ground sloping evenly, with every contour looking as if it were drawn by a straight edge the rectilinear plan has some advantages but where little ravines cut the ground into irregular contours there may be a big saving in land should a plan less stiff in appearance be adopted.

Gardening

It may be objected that the plan cuts off the garden plots and makes the keeping of cows difficult. They can be provided for on the straight streets. It has been my experience that English speaking miners in company villages do but little gardening. I believe that this is due less to the fact that they do not want to make gardens than to the thieving propensities of their foreign neighbors. American labor is largely drawn from the farms; British labor takes naturally to gardening especially floriculture but there is little evidence of a love of gardening among either of these people in American mining towns. So the need for such garden plots is not apparent.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

Representatives of the American Mining Congress, including the secretary, James A. Callbreath, appeared before the Senate Committee on Interstate Commerce, Feb. 2, for the purpose of urging the amendment of the Sherman act in such a way as to permit coal operators to unite in the establishment of trade agreements that would allow the fixing of rates and the regulation of output, subject to such control as the government may see fit to impose. It was stated that at present the bituminous industry is in an exceedingly depressed condition. The mines are idle about one-third of the year, and as about 500,000 men are engaged in the industry, the loss is manifestly great.

It was argued that at present the railroads are getting a large share of the price for coal paid by the consumer, and there is urgent need that the coal operators be permitted to unite in agreements for the establishment of satisfactory conditions in the business. By so doing, it was alleged, there would be a saving of money to the public at large, because unnecessary production would be stopped and thus the coal supply would be conserved, thereby rendering prices more stable over long periods.

Tables were submitted to show the actual condition of the industry. The witnesses depended largely upon the figures submitted by the Pittsburg Coal Operators' Association, in cases now pending before the Interstate Commerce Commission that are designed to test the equitableness of the rates between Pittsburg operating points and lake ports. The demands made by the representatives of the mining congress are similar to those made heretofore by other groups of coal operators.

Government Railroad for Alaska

President Taft, in a message read in the House on Feb. 1, recommends the appointment of a commission, including two army engineers, to report on the feasibility of building a government railroad in Alaska, and also upon the character of the Matanuska coal fields. The President recommends the adoption of the leasing system for government coal lands.

The message, after reviewing some of the relative advantages of the Bering River and Matanuska coal fields, favors the purchase by the government of the existing Alaska Central R.R. and its extension to the Matanuska field, as a most effective means of opening up a large and valuable portion of the territory. In conclusion the President says: "I am not in favor of government ownership where the same certainty and efficiency of service can be had by private enterprise, but I think the conditions presented in Alaska are of such a character as to warrant the government, for the purpose of encouraging the development of that vast and remarkable territory, to build and own a trunk-line railroad, which it can lease on terms which may be varied and changed to meet the growing prosperity and development of the territory. There is nothing in the history of the United States which affords such just reason for criticism as the failure of the federal government to extend the benefit of its fostering care to the Territory of Alaska.

Coal Rates at the Panama Canal

Prof. Emery R. Johnson, of the University of Pennsylvania, spent two days recently before the interstate commerce committee of the House of Representatives, explaining the bearing of the cost of coal in the United States upon traffic through the Panama Canal. Mr. Johnson said that he considered the coal question fully as important as the question of tolls in determining the distribution of traffic, making it essential to note the relative advantages of the Panama route, as compared with the Suez route, for the purpose of coaling. He called attention to the fact that when freight rates are high, bunker space on shipboard is exceedingly valuable, and rather than start with a great quantity of coal on board and freight capacity correspondingly reduced, owners will often take on coal later at a higher price.

This consideration means that there would be secured a great advantage in attracting freight, should we be able to supply coal cheaply and in an easily available way for vessels passing through the canal.

Mr. Johnson further said that the price of coal at the end of a ship's tackle at the Panama Canal today was about $3.80. He thought a dollar ought to be added for depreciation of coal while in storage and the cost of transportation through the canal to the western end. This would make $4.80. On the Suez Canal, last year's rates ran from $5.10 to $5.35. He concluded that coal rates could be so arranged as to direct traffic toward the Panama Canal.

Alabama

Birmingham—The state examinations for first- and second-class mine foremen and firebosses closed Jan. 26. C. H. Nesbit, chairman of the board of examiners, has made public the list of successful applicants. Twenty-two will receive certificates as first-class mine foremen; 6 as second-class foremen, and 28 as firebosses.

Birmingham has been recognized by the various railroads as an operating base for freight rates to northern Pacific Coast terminals. The new schedule of tariffs that will go into effect Mar. 11, makes sweeping reductions, and will place Birmingham on an equal shipping basis with all Mississippi River points, including Cincinnati and Memphis.

Colorado

Denver—The Union Pacific Coal Co. has filed proceedings in the district court to compel the secretary of state to extend its corporate existence. On Jan. 4, the coal company alleges, it attempted to file the usual certificate of renewal, and a second tender of the certificate and the necessary fee is said to have been made later. In both instances the secretary of state is declared to have refused to take action. The assets of the concern are shown as $616,500.

A strenuous battle between corporations and organized labor is reported to be on in the Trinidad and Walsenburg coal fields. On one side is found the Colorado Fuel & Iron Co., the Victor-American Fuel Co., the Rocky Mountain Fuel Co., and their various allied concerns; on the other is the United Mine Workers of America. Both sides are powerful and determined. The miners say they are going to organize the entire southern Colorado field. The corporations are just as determined that the men shall not join the unions, and are already financing their campaign of resistance. The Colorado Fuel & Iron Co. is said to have tacked on an additional appropriation of $20,000 for guards alone for the year 1912.

Illinois

Danville—Eight men are reported to have been injured, four seriously, by the falling of a mine cage carrying men going to work in the Electric coal mine, six miles west of Danville, on the morning of Jan. 31. The cage dropped a distance of about 200 ft. It was stated by

the mine owners that the engineer lost control of the machinery, causing one cage to drop to the bottom of the shaft, and the other, coming up empty, to be thrown from the mouth of the mine.

Girard—It is claimed that on Jan. 25 the mine of the Girard Collieries Co. broke the state hoisting record for mines having one-ton cars by raising 1827 tons of coal in an eight-hour run.

Springfield—The Citizens Coal & Mining Co. has just closed a contract for the entire output of Mine "B," which will amount to over one million dollars. This is one of the largest contracts ever let to any coal company in Sangamon County. It is made for four years with the privilege of extending it to cover six years.

Chicago—Advances proposed by the Chicago and Alton, and other railroads, of the freight rates on soft coal from Illinois mines to destinations in Missouri were suspended by the Interstate Commerce Commission from Feb. 2 to June 1, 1912. The proposed increases amounted to about 8 per cent. The matter will be investigated by the commission.

Indiana

Sullivan—Acting on a petition filed by one hundred employees of the Reliance Coal Products Co. which operates the Rood mine, east of Farmersburg, Joseph T. Akins has been appointed receiver for the company. All the miners have filed mechanics' liens against the concern. This is the third time the court has appointed a receiver for this company, which formerly operated under the name of the Hudson Coal and Mining Co.

Indianapolis—The Chicago and Wabash Valley R.R. Co. plans to make extensions to give it an air-line route from the Gary steel mills to the Indiana coal fields. At present the northern terminus of the line is 16 miles southwest of Gary, and the road has a length of 60 miles, reaching to McCoysburg.

The convention of the United Mine Workers of America adjourned Feb. 2 after adopting a policy to be followed in negotiating their wage scales and after selecting Indianapolis as the place for holding the next convention in 1914.

Kentucky

Pikeville—The Chesapeake & Ohio R.R. depot and the coal tipple, incline and other property belonging to the Marrowbone Coal & Coke Co. with main office at Uniontown, Penn., were burned Jan. 22. The loss was $15,000 in excess of the insurance. The fire is supposed to have been the work of incendiaries.

Henderson—M. V. Denton, who purchased the coal mining property and coal rights of the Southern Coal & Transportation Co. at Robards, has transferred the property to the Panama Coal & Coke Co.

Jess Strawlings, of Birmingham, and other Alabama capitalists have formed a corporation for the purpose of buying the Drury mines at Waverly and other Kentucky mining properties.

Louisville—The May Investing Co., of New York, which recently took over the 15,000 acres of coal land in Magoffin county, belonging to T. A. Spalding, is preparing to exploit this property. The sum paid was $480,000 and, while this seems large, it is in keeping with other prices being paid for similar investments in eastern Kentucky.

Minnesota

Duluth—Northwestern railroads, anticipating the possibility of labor trouble in the spring, are hoarding steam coal. The docks controlled by the various railroads entering this district are being piled high with the commodity and coal is arriving daily. Illinois coal supplies are being drawn upon, and it is predicted that the supply of railroad coal at the head of the lakes will have increased to immense proportions before April 1. It is also predicted that the commercial supply will be greatly lessened by spring.

The work of appraising the value of the mechanical apparatus at the old Philadelphia & Reading dock on St. Louis bay which has been taken over by the White Oak Coal Co., of Minneapolis, is being carried forward. The rebuilding of portions of the structure will not begin until the value of the plant has been ascertained.

Ohio

Bridgeport—It is understood that the Provident Coal Co., operating the big shaft mine at St. Clairsville, will start a new opening in the near future at Fairpoint, several miles from its present mine. The details of the plans are not yet made public, but it is certain that at least 300 men will be employed when the mine is in full operation.

Canal Dover—Surveyors employed by the Pennsylvania R.R. Co. are at work on a proposed extension of the Cleveland & Marietta branch of that railroad. The line will aid in developing a large tract of Ohio coal land.

Coshocton—Arrangements have been completed for the opening of the cannel coal field between Warsaw and Tunnel Hill, Goshocton County. Offices will be opened in Coshocton by the New York company that is developing the property. The syndicate controls something over 1500 acres of coal land in that territory.

Columbus—Early spring will see the beginning of extensive improvements by the Hocking Valley and Norfolk & Western Rys. in the way of increased yard facilities at Columbus. The plans of the former company include new tracks and shops. Deeds have lately been filed by the Norfolk & Western, covering ground that will be used for coal-storage yards. The cost of these improvements will run into the millions.

Rumors of the $30,000,000 merger of eastern Ohio coal companies have been revived, and plans are expected to be perfected within 90 days. There has been a renewal of negotiations recently and the companies included in the proposed deal have put a force of engineers and experts to work checking up their coal deposits to find out how much land is undeveloped.

Pennsylvania

BITUMINOUS

Punxsutawney—A large deal in this section has just been completed, by the sale of the property of the Bear Run Coal & Coke Co. to the Boswell Coal Co., of Baltimore, Md. The price paid was not made public. The chief stockholders in the selling company were J. B. Phelen, H. G. Bowers and W. A. Bowers, of Punxsutawney; M. Burns, of Brisbin, and T. R. Johns, of Claridge, Penn. The property is situated at Sidney, Indiana County, on the Bellwood division of the Pennsylvania R.R., and is partially developed, two mines being opened. There are 3000 acres in the tract. The Boswell company is a large producer in the Pocahontas region. It is said the company intends to greatly enlarge the operations at Sidney.

Monongahela—The Acme mine of the Pittsburg & Westmoreland Coal Co., at Bentleyville, was closed down, Jan. 27, following differences between the management and the workmen, which culminated in a strike. The miners were paid in full and the plant closed.

West Newton—After two months of idleness, the West Newton shaft mines of the Pittsburg Coal Co. have resumed operation. Other mines which have received orders to resume work are the Waverly at Smithton, and the Summers No. 4 at Pricedale.

Uniontown—By a deal closed recently, the Superba Coal Co., at Beeson, and the Smith Coal Co., at Evans, have been merged. The merger means an increase in the output of coal which is all taken by the Baltimore & Ohio R.R. as locomotive fuel. The two companies now control about 1050 acres of coal land.

Yukon—The large electric generator at the Yukon mine of the Westmoreland Coal Co. burned out, Jan. 31, and closed down the mine, throwing about 600 men temporarily out of employment.

Waynesburg—L. T. Laidley and Eli F. Baily, of Carmichaels, have secured options on a block of about 1500 acres of coal in Cumberland township, near Carmichaels, at $600 an acre. The options

run for 30 days and it is believed a sale will result.

Charleroi—Nine days that the Monongahela River was frozen over in the upper pools, cut down the river coal trade in January to less than two-thirds the average. The month's shipments amounted to 9,881,000 bu., which is about 6,000,000 bu. below the average.

Pittsburg—Reports from various railroad centers state that the big lines are storing coal in anticipation of labor troubles in the spring. At all the large storing yards on the roads cars of coal are daily being unloaded and the amount held in storage in this manner has almost doubled in the past two weeks. The local roads also are taking precautions. The Pennsylvania, it is stated, has been storing coal for some weeks.

ANTHRACITE

Scranton—It is reported that prospectors have uncovered a vein of coal about four miles west of Laporte, in Sullivan County, and drilling operations are to be started to find out just how much coal there is. An outcropping of the seam, about 28 in. thick and getting thicker as the vein runs into the hillside, has been uncovered along Loyalsock Creek. Up to a short time ago it was not known that there was any coal in the vicinity, the nearest coal operation being ten miles away. The O'Boyle & Foy Co. have been leasing coal rights in the vicinity, and machinery is now being installed to begin boring operations.

The Pennsylvania State Mine Cave commission met in the commission's offices in Scranton, Jan. 26, for the purpose of selecting one or more attorneys to attend to the legal end of the investigation and to prepare a bill for presentation to the next session of the legislature. W. J. Richards, of Pottsville, is chairman of the commission, and George M. Davies, of Lansford, is secretary.

Pittston—Theodore Hogan of this city and James White of Wilkes-Barre, have become the owners of what has for many years been known as the Bowkley tract. In underlies that section of Upper Pittston known as Church Hill and includes the mineral rights under about sixty acres of ground. The consideration was $24,000.

August Savatino was working at the bottom of No. 2 shaft of the Erie Coal Co., Jan. 29, when a huge icicle which was clinging to one of the timbers in the cribbing broke loose and fell down the shaft. It struck Savatino on the head, and he was taken to the hospital in a dying condition.

Hazelton—The new Spring Brook washery of the Lehigh Valley Coal Co., at Yorktown, near here, has been put into operation. It is the first in this part of the coalfield to be operated entirely by electricity.

Shamokin—The strike of 700 employees at the Enterprise colliery, operated by W. L. Connell & Co., of Scranton, ended by the men returning to work. Satisfactory concessions were granted by the company.

Washington

Spokane—Part of the $500,000 improvements planned for the Tono mines in Thurston County, by the Washington Union Coal Co., of which the Harriman system is the holding company, were started recently. Erection of a rescue station, hospital and general offices was begun and as soon as these are completed numerous new dwellings for the miners will be built. A $250,000 power station is included in the list of improvements that will be made at Tono during the coming year.

Large deposits of coal of good quality have been discovered in the Olympic Mountains, and preparations for early development are underway at Olympia. M. E. Reed, of Shelton, says that there are traces of the vein covering over 2000 acres. Mr. Reed has arranged with the promoters of the scheme to open a five-foot vein.

West Virginia

Charleston—Fire of unknown origin recently destroyed the power plant of the Sunday Creek Coal Co. mine at Longacre, near here, causing a loss estimated at $60,000. In consequence, the mine has been closed down until a new power plant can be erected or power furnished from one of the other mines of the company. Work on rebuilding the plant has already been started.

One of the biggest development propositions attempted in the state for a long time is that already begun by the Pond Creek Coal Co. in Mingo County, where the company has acquired 30,000 acres of coal land. Contractors have begun work on the construction of a branch from the main line of the Norfolk & Western road. The Pond Creek Coal Co. has an authorized capital of $2,000,000, and many of its stockholders are said to be the same as those interested in the big operations at Holden, Logan County. The bridge to be constructed across Pond Creek, for which authority was recently granted by Congress, will be used by the Pond Creek company to reach the main line of the Norfolk & Western. The completion of the plans of this company will greatly increase the coal output in the Pocahontas district.

Wyoming

Rawlins—The Sampo coal mine at Hanna, with about 640 acres of coal land, was purchased recently by a Cheyenne syndicate, headed by J. D. Woodruff, the Hoffman brothers and others. The property will be developed at once.

Chronology of Coal Mining for January

Jan. 1—The Virginia Iron, Coal & Coke Co. secured a $9,000,000 contract for furnishing locomotive fuel to the Boston & Maine R.R.—A general strike of miners in Belgium was threatened, when 25,000 men in the Borinage district stopped work.—The Lehigh Valley Coal Sales Co. was incorporated in order to bring the Lehigh Valley organization into conformity with the commodities clause of the interstate commerce act.—Convict labor was abandoned at the mines of the Tennessee Coal, Iron & R.R. Co.

Jan. 4—Two shot firers were rescued from an explosion in the Girard Coal Co.'s mine, at Radley, Kan., through having telephoned their whereabouts to the surface a short time previous to the accident.

Jan. 5—Fire destroyed the shops and engine house at the drift mine of the Davis Coal & Coke Co., Thomas, W. Va. Loss, $12,000.

Jan. 7—Fire destroyed a portion of the plant of the Galloway Coal & Coke Co., Carbon Hill, Ala. Loss, $50,000.

Jan. 9—An explosion in the No. 9 slope of the Parrish colliery, at Plymouth, Penn., killed six men and seriously injured two.

Jan. 10—Gov. Tener appointed a commission to revise and codify the anthracite-mine laws of Pennsylvania.

Jan. 12—A boiler exploded at the Clarence colliery of the Hillside Coal & Iron Co., Pittston, Penn., wrecking the plant.—Six men were seriously injured by the explosion of a box of dynamite caps at the Knickerbocker colliery, Shenandoah, Penn.

Jan. 15—The United States Supreme Court rendered a decision upholding an employer's liability act as constitutional.

Jan. 16—The American Federation of Coal Operators was permanently organized at a meeting in Chicago.—The twenty-third annual convention of the United Mine Workers of America opened in Indianapolis with nearly 1400 delegates present.

Jan. 17—An explosion in a mine of the Central City Coal & Iron Co., Central City, Ky., killed five men. The day shift of 200 men had just left the mine.

Jan. 18—Delegates to the national conference of coal miners in Great Britain voted unanimously in favor of a strike, Mar. 1, unless a minimum wage scale was granted. Ballots cast by the miners were 445,801 for a strike and 115,921 against it.

Jan. 20—A dust explosion in mine No. 4 of the Kemmerer Coal Co., Kemmerer, Wyo., killed five men and injured eighteen.—An ice gorge in the Ohio River, opposite Louisville, Ky., broke and caused a loss of about $20,000 to coal boats and barges.

Personals

John A. Garcia, of the Allen & Garcia Co., consulting engineers, Chicago, was in New York for several days last week attending to some matters of business.

S. D. Warriner, vice-president and general manager of the Lehigh Valley Coal Co., Wilkes-Barre, Penn., left, Feb. 2, for a two-weeks trip to North Carolina.

E. P. Merritt, assistant to the vice-president, T. B. Davis, of the Island Creek Coal Co., is now in Williamson, W. Va., looking after the opening up of the 30,000-acre tract of coal land recently purchased by the Pond Creek Coal Co.

W. H. Cunningham, general manager, and C. R. Connor, manager of mines, of the West Kentucky Coal Co., Sturgis, Ky., have resigned their positions with the company, effective Feb. 1, and will form a business partnership as consulting and contracting engineers, with offices in Huntington, W. Va.

Col. R. A. Philips, formerly superintendent of the coal-mining department of the Delaware, Lackawanna & Western R.R., has been made general manager with headquarters at Scranton as heretofore. Charles E. Tobey, formerly assistant superintendent, has been promoted to the office of superintendent.

W. J. Houston, general sales manager for the Moreland Coke Co., in Ohio, with offices in Cleveland, has been promoted to the position of general sales manager of the Moreland company, effective Feb. 1, and will hereafter be located at Pittsburg, Penn. Mr. Houston has been in the employ of the Moreland Coke Co. for the past two years and previously was general sales agent of the Big Vein Coal Co., one of the Youghiogheny & Ohio interests.

Yes, Sir! Our old friend Everett Moore, chief engineer of the Consolidation Coal Co., Fairmont, W. Va., slipped one over on us, and is now a "lifelong member" of the Benedicts' Club. Just when we were about to pass him up as a hopeless prospect, he goes and doubles his expenses, triples his happiness and pretends that all he ever pined for was a bungalow with gas logs in the parlor. All right, Everett! Here's wishing you happiness unmeasured. May a long line of descendants add luster to your name! Now that Frank Haas has started the game and you have followed suit, we suppose the "Consolidation" will force the habit by compelling unmarried employees to contribute regularly to an orphan asylum or a spinsters' fund. However, let us say right now, that if any more of our friends try this same plan of letting us in on the secret after the "Wedding Cake" is all eaten, we'll write something about them that will read like "Why Wives Leave Home."

Obituary

W. W. Worthington, president of the Montana Coal & Iron Co., and one of the prominent coal operators in Montana, died, Jan. 30, from heart disease. His family resides in New York, where the body was sent. Mr. Worthington, who was well known throughout the Northwest, had been ill for several months.

James Collins, president and general manager of the Allburn Coal & Coke Co., of Matewan, W. Va., died at his home in Matewan, Wednesday, Jan. 31. He was born in Staffordshire, England, July 8, 1864. Mr. Collins was well known in the Pittsburg district, having been employed for a number of years by the National Mining Co.

Philip Davis, of Duquoin, Ill., a member of the executive board of the Illinois miners, died suddenly, Jan. 24, at Indianapolis, where he had gone to attend the convention of the United Mine Workers. Mr. Davis had been prominently identified with the miners' organization for a number of years and had many friends in southern Illinois.

Construction News

Punxsutawney, Penn.—The Boswell Coal Co., of Baltimore, Md., has purchased the property of the Bear Run Coal Co., in Indiana County, and intends to greatly enlarge the operations at Sidney.

Moundsville, W. Va.—Proposals for an elevator to be furnished complete at the tipple of the Panama mine will be received by the Ben Franklin Coal Co., Moundsville, W. Va. M. J. McQuade is general manager.

Birmingham, Ala.—The Pratt Consolidated Coal Co., of Birmingham, will construct facilities for coaling vessels at Mobile, Ala.

St. Clairsville, Ohio—The Big Five Coal Co. has increased its capital stock from $200,000 to $300,000 to provide for extensions and improvements at its operations. Samuel Pursglove, Sr., is president.

Columbus, Ohio—The Hocking Valley and Norfolk & Western railroads will make extensive improvements at Columbus, including storage yards, increased track facilities and shop buildings.

Spokane, Wash.—The Washington Union Coal Co., a subsidiary of the Harriman railroad interests, contemplates the erection of a $250,000 power plant at the Tono mines, Thurston County, Washington.

Recent Incorporations

Huntington, W. Va.—The Pinson Fork Coal Co., of Huntington, to mine coal and manufacture coke in Kentucky; capital, $100,000. Incorporators: A. E. Bush, E. M. Watts, I. J. Bryan and others, all of Huntington.

The Amherst Coal Co., of Red Star, W. Va., to mine and deal in coal and other minerals; capital, $50,000. Incorporators: George M. Jones and W. R. Thurmond, of Oak Hill, W. Va., and three others.

The Turkey Foot Land & Lumber Co., of Huntington, to mine coal and manufacture lumber in Jackson County, Ky.; capital, $300,000. Incorporators: C. L. Ritter, H. T. Lovett, E. E. Williams and others, all of Huntington.

Charleston, W. Va.—The Lane-Whitmer Stores, Inc., of Charleston, to mine coal and engage in a general mercantile business; capital, $500,000. Incorporators: Harry E. Moyer, L. S. Lucas and Max Stozzie, of Philadelphia, Penn., and others.

Spokane, Wash.—The Tanum Coal Co., to develop a tract of coal land on Tanum Creek, near Ellensburg, Wash.; capital, $500,000. A. N. Cantrill, of the Spokane Gas Co., is one of the incorporators.

Harrisburg, Penn.—The Keystone Coal & Coke Co.; capital, $400,000. Incorporators: Richard Coulter, Geo. F. Huff, E. M. Gross, Lloyd B. Huff, Robert Pitcairn, Jr., and Robert K. Cassatt.

Pittsburg, Penn.—The Atlas Coal Co., of Pittsburg; capital, $250,000. Incorporators: G. Z. Hosack, J. A. Bell, J. B. Haines, Jr., and others.

Connellsville, Penn.—The Connellsville Coke Co., of Connellsville; capital, $33,000. Incorporators: J. Fred Kurtz, W. D. McGinnes and R. S. Matthews, Connellsville.

The Etna-Connellsville Coke Co., Connellsville; capital, $125,000. Incorporators: Cyrus Echard, G. W. Campbell and D. N. Parkhill, Connellsville.

The Superba Coal Co., of Connellsville; capital, $10,000. Incorporators: A. C. Stuckel, M. E. Brazell and J. W. Buttermore, Connellsville.

Barbourville, Ky.—The Clover Fork Coal Co., to operate mines in southeastern Kentucky; capital, $50,000. S. F. Whitfield is one of the incorporators.

Industrial Notes

The rapidly increasing demand in Pittsburg and vicinity for asbestos, magnesia and other products of the H. W. Johns-Manville Co., has necessitated a move from their former location in Liberty Ave., above Ninth St., to larger quarters. Since Jan. 24, 1912, the Pittsburg branch of the H. W. Johns-Manville Co., has, therefore, occupied the entire eight-story stone, reinforced-concrete and steel building at the northeast corner of Wood St. and First Ave., which has been leased by them for a term of years.

The McGraw-Hill Book Co. announces the completion of arrangements for the sales agency of the technical books of the Railway Age Gazette, American Engineer and Signal Engineer. This makes the McGraw-Hill Book Co. publishers and distributors of books for the three journals, but it does not affect the publication of the papers themselves in any way. With the addition of these three papers in the railroad field, the McGraw-Hill Book Co. now publishes books for the twelve leading American engineering papers in the fields of civil, mechanical and electrical engineering, electric and steam railroading, machine tools, mining, metallurgy, chemical engineering, etc. The papers now represented are American Machinist, Engineering News, Electrical World, Railway Age Gazette, Electric Railway Journal, Power, Engineering Record, Engineering and Mining Journal, Coal Age, Metallurgical and Chemical Engineering, American Engineer and Signal Engineer.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The fuel shortage continues unchanged, except possibly a further tightening of the situation, particularly in the East. Anthracite supplies are estimated to be smaller than at any time for a number of years and spot coals of all grades are commanding good prices and are eagerly sought for storage purposes. Complaints of railroad service are general, which condition is seriously affecting production at the mines.

Low temperatures in the East, causing a heavy consumption, together with the slow movement, both by rail and water, are making the situation acute at some points. Many large consumers are now anxious to store in anticipation of a possible strike Apr. 1, but are having trouble in finding any free coal.

In the Pittsburg district, bituminous is in good demand with prices hard, and coke holding firm under an unusually heavy production. An over-production of slack in the Ohio fields has caused a break in prices on this grade, although market in other sizes continues strong with the dealers in command. Poor transportation facilities are curtailing production at the mines to about 50 or 60% capacity, and, as a result, there is no spot coal to be had. The nonunion fields to the South are preparing for a heavy production in event of a shutdown at the organized mines on the expiration of the present agreement.

Prices in the Middle West are off slightly, but still above normal. Stocks are materially reduced, the movement slow and demands urgent, with only sufficient tonnage to meet the requirements for immediate consumption. Court orders have been issued governing the movement on some of the railroads and others have been compelled to confiscate fuel. The Western market remains quiet and unchanged.

Boston, Mass.

February was ushered in by three days of storm, and dealers and large consumers were caused further anxiety over slow moving cargoes. There has been no break in the seasonable weather and demand is active for coal of every kind. All over there are instances of dealers with but a few days' supply awaiting arrivals either of cars or cargoes detained by adverse weather. The situation is acute, and a partial suspension, such as that in effect at the textile mills in Lawrence, is a decided relief to some of the soft-coal shippers who have been able to supply only in a hand-to-mouth fashion.

The great difficulty in getting barges from Hampton Roads has lately diverted some tonnage to Philadelphia, and there has been a slight advance in the f.o.b. price for spot coal on that account. Coal from the Clearfield districts has been sold up to $2.60, f.o.b., and an extra demand for that grade is in prospect between now and Apr. 1.

All-rail bituminous is only changed in the way of still slower deliveries and higher prices for spot coal at the transfer points. Coal available for February has been marked up by practically all the shippers.

The supplies of anthracite in New England seem to be further and further reduced. With the storage depots maintained here at tidewater by certain of the mining companies, bare of all sizes, an increased demand is thrown on the companies that ship all-rail, a demand which the latter are unable to meet.

Current prices are as follows:

Clearfield, f.o.b. mines	$1.25@1.45
Somersets, f.o.b. mines	1.35@1.55
Pocahontas, New River, Boston, on cars	4.35@4.60
Pocahontas, New River, Providence, on cars	4.25@4.50
The same coals, for shipment, f.o.b. Hampton Roads	2.70@2.75

New York

The stocks of soft coal on hand at the New York piers are considerably below normal. Shippers are still complaining of poor car supply and of slow railroad movement. These conditions coupled with a heavy demand on contract business, tend to keep the supply here low. There is a strong demand for the better grades of steam coal, but these are scarce and purchasers of coal are obliged to substitute the cheaper grades because of the scarcity of standard steam coals.

Prices show some advance from last week, West Virginia steam coals being firm at $2.60 f.o.b., while the ordinary grades of Pennsylvanias are being held at from $2.65 to $2.70, with the standard steam coals practically out of the market.

Congestion and accumulation of freight along the railroads are retarding the delivery of coal to line consumers and causing them much uneasiness as to their supply. This has caused a sharp increase in the demand for all-rail coal. Consumers generally are endeavoring to accumulate stocks in anticipation of labor troubles in the mining regions the first of April, but are finding their supplies gradually decreasing, instead of increasing.

The winter weather so far experienced has been much more severe than any for a number of years and has not only affected transportation, but has undoubtedly caused a marked increase in consumption which should keep the market on a firm basis for some time to come.

Marine transportation in the harbor and sound is made hazardous by the ice conditions. At the piers, while not so much difficulty is being experienced in the handling of frozen coal as during the preceding two weks, there is still delay of from two to three days in loading. Under these conditions the coal shippers are experiencing great difficulty in taking care of their business.

Philadelphia, Penn.

The beginning of the week witnessed another snow flurry, with a low temperature, and, as a consequence, dealers are beseiged with requests for urgent filling of orders, and additional ones are piling up. The anthracite trade at this point could not be improved upon, as all the tonnage coming in is being taken care of, and the additional cold snap only adds discomfort to an already unpleasant condition.

The reflection of the retail trade is seen in the wholesale. The tonnage for the month of January was considerably in excess of the previous year for the corresponding period, and the operators are already planning for a successful February. Comparisons so far this month indicate that the month of February will also prove to be a better coal-burning month than the same time last year—at least the tonnage will move off, which is all that is required. All sizes still continue in demand, and it is understood that some of the companies are turning down orders for some of the large sizes, it being impossible to supply the market, as well as the quantity required for contracts.

The bituminous market shows some improvement, prices being somewhat stiffer, due in part to the fact that there is restricted mining on account of the weather, and poor movement along the railroads. There is also a slight shortage of cars, all of which has a tendency to stiffen the market on this grade of coal.

Pittsburg, Penn.

Bituminous—The annual convention of the United Mine Workers, at Indianapolis, adjourned, with no scale settlement being reached. While negotiations will still be conducted with the operators, there is practically no prospect of any agreement being reached before the termination of the scale, Mar. 31, and a suspension of mining for six weeks or so is likely before an agreement will be attained. While consumers have not begun stocking up yet on a liberal scale, there is a disposition in this direction, and odd lots offered in the market find ready acceptance, making prices steadier than for a long time.

Demand for domestic coal continues excellent, on account of the cold weather. We quote: Nut, $1.05@1.10; mine-run, $1.10@1.15; ¾-in., $1.20@1.25; 1¼-in., $1.35@1.40; slack, 70@75c. per ton at mine, Pittsburg district.

Connellsville Coke—The market for prompt furnace coke has eased off a trifle, being quotable at $1.80 to $1.90, against $1.85 to $2 a week ago. This is due to heavier production, but the market has not weakened as much as would have been expected, with production running, as reported, at fully 400,000 tons a week. Sales of prompt furnace coke within this range have been made in the past week to the extent of 150 to 175 carloads. No further contracting is reported. Furnaces are well covered, unless it is necessary to blow in additional stacks. Foundry coke has stiffened, on account of scarcity, and there has even been buying of small lots by producers. We quote: Prompt furnace, $1.80@1.90; contract furnace, $1.80@1.90; prompt foundry, $2.15@2.25; contract foundry, $2.20@2.40.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Jan. 27, at 400,597 tons, a decrease of 6000 tons, and shipments of 4220 cars to Pittsburg, 5829 cars to points West and 1064 cars to points East, a total of 11,113 cars, a decrease of 158 cars.

Baltimore, Md.

Heavy buying on the part of a large number of consumers, for stocking-up purposes, was the feature of the Baltimore market during the last week. Fear of a possible strike has caused many to reach the conclusion that it would be wise to look ahead, and some have been purchasing freely during the last few days. The large operators here predict that this rather heavy buying on the part of far-sighted consumers will continue for several weeks, or until they are reasonably sure that the operators and their employers will reach some satisfactory agreement.

The activity in the market caused prices of all grades of coal to remain firm. The low grades, according to figures obtained at several offices, are still being quoted from 80c. to $1. Better grades can be purchased from $1.05 to $1.20, while big vein coal is quoted from $1.30 to $1.60.

At the port of Baltimore, congested conditions are no longer encountered. While there is considerable ice in the river and bay, it is not proving the hindrance to shipping operations that it did during the zero spell of weather.

Buffalo, N. Y.

There is a good demand for bituminous coal, and it appears to increase from week to week. Prices are firm, but there is little prospect of an advance. The real advantage gained over the early part of the winter is that little or no coal is selling at a sacrifice or at the terms of the consumer. In fact, the rail movements are so slow that the seller is much more in command of the situation than for some time, and keen competition is the only thing preventing an immediate advance. Dealers, however, find that they cannot safely advance their prices, as buyers usually know where to find a supply at the old prices.

There is much complaint against some of the railroads, for allowing their business to become so badly congested. The New York Central and Nickel Plate roads are especially slow in their movements and some very aggravated cases of delay are in evidence.

Bituminous prices are strong at former figures, $2.50 for Pittsburg three-quarter, $2.40 for mine-run and $2.25 for slack, with coke doing better than formerly, at $4.25 for best Connellsville foundry and $3.50 for stock coke. Allegheny Valley prices are about 25c. lower than Pittsburg.

The anthracite situation remains unchanged, with every ton of coal that the shippers can get going at once into consumers' hands.

It is predicted that there will be a greater shortage of anthracite at the opening of spring than has ever been seen before in the trade. It is common to put a large amount of it afloat here in readiness for the opening of the lakes, but none is to be had for such purposes yet. Soft-coal dealers who can get independent anthracite readily, can sell it at a premium if they choose.

Cleveland, Ohio

The weather in the last week has been much milder, and railroads have given better service in handling coal to the markets. Domestic lump has had a good demand, with prices firm. There is a decided demand for steam grades in mine-run and ¾-in., particularly mine-run; slack has been somewhat of a drug in the market for a week, prices in consequence dropping 10 to 15c. Every available car of slack that could be secured was rushed to this market when the railroads got busy after the snow blockades, which resulted in prices breaking, as it could not be handled in time to save car demurrage. However, the situation at this moment is somewhat relieved, and the general impression is that slack will again become scarce in the next week or ten days.

Columbus, Ohio

Continued low temperatures, coupled with the congestion on all initial and connecting railroads, has had the effect of keeping the coal trade in Ohio firm during the last week. Considerable demoralization is reported on all lines, and the lack of motive power is the chief obstacle to a better movement. Thousands of loaded cars are sidetracked on all lines, and the danger of a coal famine in certain sections is growing worse.

The cold weather has shown that not one of the railroad lines has been equipped to handle traffic in a time of stress. The fault has been both with the initial lines and the connecting roads, but the latter are probably more at fault than the former.

Prices have remained steady at the circular figure, and every branch of the trade is firm. Fine coal is a little weaker, but the recession in price was only slight. The demand for steam grades is good, as there is a disposition on the part of certain large users to store, in anticipation of a suspension after Apr. 1. Some of the railroad lines have stored a large amount of fuel in case of emergency. Retailers are clamoring for shipments, and in many cases their customers are inconvenienced. No great actual suffering has been reported in central Ohio, as yet.

Operations at the mines have been irregular, some reporting from 50 to 65% capacity, while others have been fortunate enough to show a larger production. Inability to secure cars and congestion on the roads are the causes of this decreased production. Practically every mining district of the state is affected by these conditions, but the greatest loss is in the eastern Ohio district.

Reports show that there are between 4000 and 5000 loaded coal cars at Toledo waiting movement to Michigan and northern Indiana points. There is great danger of a coal famine in Detroit, and frantic efforts are being made to remedy that condition.

Prices prevailing in Ohio are as follows:

Domestic lump in Pomeroy Bend district	$1.65@1.75
Domestic lump in the Hocking Valley	1.50
Three-quarter inch	1.35
Nut	1.15
Mine-run in eastern Ohio	1.00@1.05
Mine-run in the Hocking Valley	1.05@1.15
Nut, pea and slack	0.75@0.85
Coarse slack	0.65@0.75

Charleston, W. Va.

January has been one of the poorest months in production that this state has had for a long period. The weather conditions were such as to close, for a time, some of the mines and, when they were able to resume, the car supply was inadequate and this still continues in the Chesapeake & Ohio region, the mines working on an average of only one or two days a week. Other sections of the state are reported almost as bad. As a result the output for January will be lower than it was in January, 1911, one of the lowest months for many years, and unless the car supply soon resumes normal conditions February will be found in the same class

The car shortage, however, has had a tendency to increase prices except, of course, on contracts. Kanawha district slack has gone up to, in some instances, as high as 85c., while lump from the same district is bringing $1.50@1.60. New River mine-run is about the same as in the Kanawha district, but New River egg is bringing as much as $1.80.

Even with an early spell of warm weather it will take a considerable time before loaded cars can be sent to their destination, the empties returned to the mines and a normal condition on the rails and at the mines restored.

Louisville, Ky.

The variable weather of this winter is keeping up the brisk demand for fuel, which has made the present season one of the best, from a dealer's standpoint, for years. The retailers, however, have lived up to promises made earlier in the winter that, except in case of extraordinary conditions, the price of coal should not be boosted to unreasonable and exorbitant figures. One effect of the severe weather will be that reductions in price, which usually accompany the approach of spring, will be delayed longer than usual. Much suffering among the poorer classes has occurred, due to the low temperatures.

Owners of factories, and agents for office and store buildings, have experienced much trouble in providing sufficient motive power and heat, respectively. Relays of firemen and furnace feeders have been kept on duty constantly in many instances.

The demand for nut and slack continues to be unprecedented, due to the requirements of the steam-heating plants. The quotations by retailers continue to range as follows: Banner lump, $3.25; Jellico, $3.60; Wilton-Jellico, $3.60; Pittsburg, $3.75; Taylor, $3.25.

Nashville, Tenn.

Business continues to be excellent, although the mines here are handicapped by an insufficient supply of cars, which makes it hard for them to keep up with their orders. Prices are unchanged and the demand good. Screenings are still bringing a good price and are in big demand.

Every indication points to the west Kentucky nonunion field being extremely busy this spring provided there is a shutdown throughout the union fields of the country. St. Louis will draw very heavily from this field and the operators here are anxiously awaiting the time. The privilege of shipping coal at a good price North every two years is a welcome one.

So far there has been no demand for coal for storage purposes from this field as what little coal is being stocked is being taken from lines adjacent to the territory to which it is used, at a much cheaper freight rate. Should we have a late spring with plenty of cold weather, the chances are that the west Kentucky field will be called upon for storage coal during the month of March.

Indianapolis

Indiana coal operators report business good, due to continued cold weather. The low temperature during the entire month of January thoroughly frightened the people of the country, who were unprepared for it, and the result is that they are preparing to secure themselves against further suffering this winter.

Nearly all the mines of the state are working almost steadily, or as many days as are possible with the present car shortage. The railroads appear utterly unable to handle the business, the trouble being with the bad condition of their rolling stock. The retrenchment policy, instigated by a number of roads over a year ago, is now causing them to lose business amounting to ten times the cost of keeping the cars and locomotives in good serviceable condition. Among these railroads are great lines of coal cars out of condition and unfit for use, while the repair shops are full of engines awaiting repairs to make them serviceable. In Brazil, Terre Haute and other coal centers, all the tracks of the coal roads are full of crippled cars and locomotives.

Chicago

While prices in the Chicago market continue to decline, they are still far above a normal condition. The chief factor in the situation is the car supply. A combined movement of some delayed coal and of all that more recently shipped is caring for the current demand—and that is all. It is not expected that the market will become very soft until stocks can be replenished and old orders filled. Another cold wave also is having a strengthening effect.

Smokeless coal is variable in price, but in strong demand. What little there is of spot smokeless coal commands a price of $1.25 to $1.40 for mine-run. On shipments direct from the mines, prices range from $1.10 to $1.25. Hocking maintains a strong position. The market for screenings has been exceptionally satisfactory to dealers, holding firm at $1 to $1.10 for small-size screenings and $1.10 to $1.25 for the 2-in. variety. The anthracite market is still tight.

Prevailing prices at Chicago are as follows:

Sullivan County:	
Domestic lump	$2.62@2.87
Egg	2.62@2.87
Steam lump	2.22@2.37
Screenings	1.97@2.07
Springfield:	
Domestic lump	$2.57@2.67
Steam lump	2.17@2.27
Mine-run	2.07@2.17
Screenings	1.77@1.92
Clinton:	
Domestic lump	$2.52@2.77
Steam lump	2.22@2.32
Mine-run	2.17@2.27
Screenings	1.77@1.92
Pocahontas and New River:	
Mine-run	$3.15@3.30
Lump and egg	4.20@4.30

Coke—Prices asked for coke are: Connellsville and Wise County, $4.50@4.65; byproduct, egg and stove, $4.85; byproduct, nut, $4.55@4.65; gas house, $4.90@5.

Minneapolis—St. Paul

The retail trade in the Twin Cities report a favorable week even though business has not been extremely rushing, which has given them time to catch up on orders taken in. Both in Minneapolis and St. Paul the retailers' stocks have been reduced materially and they are experiencing troubles in getting cars when they want them. However, a shortage in the Twin Cities is not probable, due to the short haul from the docks, unless the severe cold weather of January should be duplicated.

Wholesalers report business good in the country, but are complaining of the car shortage and of the railroads confiscating coal for their own use. Prices on all grades are selling for circular or better and some big premiums are offered for coal in transit nearby. Steam plants are asking for quotations and their buying from now on will be a factor until the strike situation is definitely settled.

Another feature of cognizance is that the railroads are buying and storing considerable coal—fearing a possible shutdown at the mines. Railroads operating in the Northwest are taking no risks of a car shortage and are not letting their cars off the initial road, except under extreme necessity.

St. Louis, Mo.

Following the snow storm of last Saturday came a cold snap similar to that in January, and with the poor motive power on the railroads, spot coal at East St. Louis commanded almost anything the shipper asked. Carterville lump and egg

opened strong, and there was but little to be had as the railroads are taking practically all of the available coal from that field. As reported previously, this is not done openly, but, nevertheless, the railroad companies are storing in large quantities, and nearly every mine in the Carterville field is being pushed for railroad coal.

The washers in the Carterville field were again put out of commission on account of the cold weather, but raw coal is bringing such a price now that it pays the operator better to omit the washing.

The Standard market has been in a somewhat unsettled condition during the past week, jumping from $1.15 last Saturday morning to $1.50 before noon, and it opened strong Monday, with everything to indicate that the Standard operators will be able to keep the market up.

The only operators in the Standard field that are getting any service from the railroads are the mines at St. Clair and Wildermann, where the operators have a court order, compelling the Illinois Central to give them cars every day that they are available, regardless of whether other mines get cars or not. The market on the inner district high-grade coals is in good condition, the demand exceeding the supply. A large tonnage of this coal is moving into the Northwest.

The anthracite movement in St. Louis has been fairly good, considering the poor service of the railroads. Coke is in good demand at $5 for byproduct and $4.75 for gas house.

The past week opened up with the following prevailing prices:

Franklin County	
Lump and egg	$2.00@2.25
No. 1 nut	2.00@2.25
No. 2 nut	1.85@2.00
No. 3 nut	1.25@1.40
2-in. screenings	0.90@1.00
Carterville	
Lump and egg	$2.00@2.25
No. 1 nut	1.85@2.00
No. 2 nut	1.50@1.60
No. 3 nut	1.25@1.40
Screenings	0.80@0.95
Mine-run	1.15@1.25
Standard	
6-in. lump	$1.75@1.85
2-in. lump	1.50@1.60
3x6-in. egg	1.25@1.40
No. 1 nut	1.00@1.10
No. 2 nut	0.90@1.00
Screenings	0.80@0.90
Mt. Olive	
6-in. lump	$1.50@1.60
3-in. lump	1.50
3x6-in. egg	1.35
No. 1 nut	1.10
No. 2 nut	1.00

Spokane, Wash.

The weather in the Inland Empire has moderated to such an extent that little coal is being used in the residence districts, other than just enough to keep the chill off of the interior. The sales from the local yards have decreased materially and the supply is slowly being replenished to prepare the dealers in case of emergency.

The prices have not changed for some time in the better grades. However, some of the cheaper coals have decreased slightly to increase the demand.

The standard values continue as follows:

	Wholesale	Retail
Rock Springs	$7.20	$9.00
Owl Creek	7.20	9.03
Kirby	7.20	9.00
Carney	6.70	8.50
Bearcreek	6.35	8.25
Roslyn steam	5.25	6.25

Portland, Ore.

The situation as to the demand for fuel in this state remains unchanged since last week, the weather continuing mild. This has been a mild winter, and the demand for coal has been light.

Business in general is fair and showing signs of improvement. There is a good deal of activity in the building line here, with every indication of a very busy season the coming summer. The forthcoming completion of the Panama Canal, everybody predicts, is going to cause a wonderful activity on this coast in all lines of commerce, and a very heavy coastwise movement is anticipated. A number of vessels are now being built in Pacific Coast yards to ply between ports on the Pacific and the Atlantic. If vessels can be engaged to bring coal here from the Atlantic Coast at considerably lower prices than are charged now, it should create a new and active demand for that class of fuel, as wood prices are high enough to admit of competition, in spite of the fact that Oregon produces immense quantities of lumber. At present Australian coal is quoted at $10. Domestic coal may be had as low as $6.50, but it does not enter very heavily into competition with Wyoming or Australian coal.

Production and Transportation Statistics

Imports and Exports

The following is a comparative statement of coal and coke imports and exports from the United States for the years 1910-11, in long tons:

EXPORTS

	1910	1911
Anthracite:		
Canada	2,963,788	3,498,980
Other countries	57,839	55,019
Total	3,021,627	3,553,999
Bituminous:		
Canada	7,567,297	10,609,587
Panama	.....	496,830
Mexcio	675,980	470,674
Cuba	858,776	1,053,703
West Indies	487,519	577,159
Other countries	1,194,667	670,801
	10,784,239	13,878,754
Coke	879,123	914,142

IMPORTS

Anthracite	.....	2,159
Bituminous:		
United Kingdom	13,124	9,278
Canada	1,675,692	980,174
Japan	56,278	16,031
Australia and Tasmania	240,899	232,969
Other countries	5,950	356
Total	1,991,943	1,238,808
Coke	156,417	69,515

Great Northern Ry.

Great Northern's coal movement from Duluth to Minneapolis and St. Paul in January totalled 5137 cars, breaking all records. Consumptive coal demand is heaviest on record in Northwest on account of continued cold weather.

Foreign Markets

Great Britain

Stemming is becoming increasingly difficult for February positions, and prices are firm. The outlook in regard to the labor situation is a little more hopeful. Quotations are approximately as follows:

Best Welsh steam coal	$4.68@4.80
Seconds	4.50@4.62
Thirds	4.20@4.44
Best dry coals	4.26@4.38
Best Monmouthshire	4.20@4.26
Seconds	3.96@4.02
Best Cardiff small coal	2.52@2.64
Seconds	2.34@2.46

The above prices for Cardiff coals are all f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport, both exclusive of wharfage and for cash in 30 days, less 2½% discount.

Financial Notes

The Fairmount Coal & Coke Co., of Pennsylvania, has announced that its coupon 34, due Dec. 1, 1906, on the first mortgage bonds, will be paid on presentation to the Farmers' Loan & Trust Co.

After charging operating expenses of the Railway and the Coal & Iron Co. with renewal expenditures, Reading Co. earned $4,480,688 after charges in the six months to Dec. 31, as against $4,029,076 a year ago. Deducting preferred dividends there remains for the $70,000,000 common stock a balance of $3,080,688, or 4.4% in contrast with $2,629,076, or 3.7% last year.

Solvay Process Co., Syracuse, N. Y., on Jan. 31, filed a certificate increasing the capital stock from $10,000,000 to $15,000,000, the new shares to be distributed as a stock dividend of 50%. Secretary George E. Francis is quoted as saying that the increase is made in order to place the capital stock on a basis proportionate to the volume of business done by the company.

The Delaware, Lackawanna & Western Coal Co. reports for year ended Dec. 31 last:

	1911	Increase
Coal sales	$39,865,493	$1,197,243
Expenses	38,235,111	1,000,114
Net income	1,630,382	197,129
Other income	165,278	55,915
Total income	1,795,660	253,043
Dividends	659,070	.....
Surplus	1,136,590	253,043

The profit and loss surplus on Dec. 31 was $2,513,120.

At Boston, on Feb. 2, Judge Dodge in the United States District Court appointed John T. Burnett, of Southboro, Mass., as receiver of the Rhode Island Coal Co. on application by H. M. Whitney, who stated that the company was without working capital or borrowing capacity. The following reorganization committee has been nominated: Charles B. Jopp, president, Beacon Trust Co.; Edward Page, vice-president Federal Coal & Coke Co.; Herbert A. Tucker, of Tucker, Hayes & Co.